



## MATHS

### BOOKS - OBJECTIVE RD SHARMA ENGLISH

#### DEFINITE INTEGRALS

#### Illustration

1. The value of the integral  $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$  is :

A.  $\frac{\pi}{2} + 1$

B.  $\frac{\pi}{2} - 1$

C. -1

D. 1

**Answer: B**



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2. The value of  $I = \int_0^{\pi/2} \frac{(\sin x + \cos)^2}{\sqrt{1 + \sin 2x}} dx$  is

A. 3

B. 1

C. 2

D. 0

**Answer: C**

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3. If  $I(m, n) = \int_0^1 t^m(1+t)^n \cdot dt$ , then the expression for  $I(m, n)$  in terms of  $I(m+1, n-1)$  is:

A.  $\frac{2^n}{m+1} - \frac{n}{m+1} I(m+1, n-1)$

B.  $\frac{n}{m+1} I(m+1, n-1)$

$$C. \frac{2^n}{m+1} - \frac{n}{m+1} I(m+1, n-1)$$

$$D. \frac{m}{n+1} I(m+1, n-1)$$

**Answer: B**



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4. If  $af(x) + bf\left(\frac{1}{x}\right) = \frac{1}{x} - 5$ ,  $x \neq 0$ ,  $a \neq b$ , then  $\int_1^2 f(x) dx$  equals

$$A. \frac{(\ln 2 - 5)a + \frac{13}{2}b}{a^2 - b^2}$$

$$B. \frac{(\ln 2 - 5)a + \frac{7b}{2}}{a^2 - b^2}$$

$$C. \frac{(5 - \ln 2)a + \frac{7b}{2}}{a^2 - b^2}$$

D. none of these

**Answer: B**



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5.  $\int_{\pi/4}^{3\pi/4} \frac{dx}{1 + \cos x}$  is equal to

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6. If  $\int_0^a \frac{1}{1 + 4x^2} dx = \frac{\pi}{8}$ , then  $a = \dots\dots$

A.  $\frac{\pi}{2}$

B.  $\frac{\pi}{4}$

C. 1

D.  $\frac{1}{2}$

**Answer: D**

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7. The solution for  $x$  of the equation  $\int_{\sqrt{2}}^x \frac{dt}{t\sqrt{t^2 - 1}} = \frac{\pi}{2}$  is  $\pi$  (b)  $\frac{\sqrt{3}}{2}$  (c)  $2\sqrt{2}$  (d) none of these

A.  $\frac{\sqrt{3}}{2}$

B.  $2\sqrt{2}$

C. 2

D.  $-\sqrt{2}$

**Answer: D**

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8. For real number  $u$ ,  $\frac{-\pi}{2} < \tan^{-1} u < \frac{\pi}{2}$  and  $0 < \cot^{-1} u < \pi$ , then

the value of  $\frac{\int_0^1 \cot^{-1}(1-x+x^2) dx}{\int_0^1 \tan^{-1} x dx}$ , is :

A.  $\log 2$

B.  $\frac{\pi}{2} + \log 2$

C.  $\log 4$

D.  $\frac{\pi}{2} - \log 4$

**Answer: A**



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9. Let  $\frac{d}{dx}F(x) = \frac{e^{\sin x}}{x}$ ,  $x < 0$ . If  $\int_1^4 \frac{2e^{\sin x^2}}{x} dx = F(k) - F(1)$  then find the possible value of  $k$ .

A. 4

B. 8

C. 16

D. 32

Answer: C



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10. Evaluate the following integral:  $\int_0^{\pi/4} \frac{s \in x + \cos x}{3 + s \in 2x} dx$

A.  $\log 2$

B.  $\log 3$

C.  $\frac{1}{4}\log 3$

D.  $\frac{1}{8}\log 3$

**Answer: C**



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11. If  $I_1 = \int_e^{e^2} \frac{dx}{\ln x}$  and  $I_2 = \int_1^2 \frac{e^x}{x} dx$  then

A.  $I_1 = I_2$

B.  $2I_1 = I_2$

C.  $I_1 = 2I_2$

D. none of these

**Answer: A**



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12. The value of integral  $\int_0^{\log 5} \frac{e^x \sqrt{e^x - 1}}{e^x + 3} dx$  is

A.  $3 + 2\pi$

B.  $4 - \pi$

C.  $2 + \pi$

D. none of these

**Answer: B**



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13. Given  $\int_1^2 e^{x^2} dx = a$ , the value of  $\int_a^{e^4} \sqrt{\ln(x)} dx$  is :

A.  $e^4 - e$

B.  $e^4 - a$

C.  $2e^4 - a$

D.  $2e^4 - e - a$



**Answer: D**



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14. If  $\int_0^1 \frac{\sin t}{1+t} dt = \alpha$ , then the value of the integral  $\int_{4\pi-2}^{4\pi} \frac{\sin\left(\frac{t}{2}\right)}{4\pi+2-t} dt$  is (1)  $2\alpha$  (2)  $-2\alpha$  (3)  $\alpha$  (4)  $-\alpha$

A.  $2\alpha$

B.  $-2\alpha$

C.  $\alpha$

D.  $-\alpha$

**Answer: D**



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15. Evaluate the following definite integral:  $\int_0^{2\pi} e^{x/2} \sin\left(\frac{x}{2} + \frac{\pi}{4}\right) dx$

A.  $2\pi$

B.  $e^\pi$

C. 0

D.  $2\sqrt{2}$

**Answer: C**

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16. If  $I_n = \int_0^{\pi/4} \tan^n \theta d\theta$ , then  $I_8 + I_6$  equals

A.  $\frac{1}{4}$

B.  $\frac{1}{5}$

C.  $\frac{1}{6}$

D.  $\frac{1}{7}$

**Answer: D**

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17.  $\int_0^2 \frac{x^3}{(x^2 + 1)^{3/2}} dx$  is equal to

A.  $(\sqrt{2} - 1)^2$

B.  $\frac{(\sqrt{2} - 1)}{\sqrt{2}}$

C.  $\frac{\sqrt{2} - 1}{\sqrt{2}}$

D. none of these

**Answer: D**



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18. The value of the integral  $I = \int_0^a \frac{x^4}{(a^2 + x^2)^4} dx$  is

A.  $\frac{1}{16a^3} \left( \frac{\pi}{4} - \frac{1}{3} \right)$

B.  $\frac{1}{16a^3} \left( \frac{\pi}{4} + \frac{1}{3} \right)$

$$C. \frac{a^3}{16} \left( \frac{\pi}{4} - \frac{1}{3} \right)$$

$$D. \frac{a^3}{16} \left( \frac{\pi}{4} + \frac{1}{3} \right)$$

**Answer: A**



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19. Let  $f(x) = 7 \tan^8 x + 7 \tan^6 x - 3 \tan^4 x - 3 \tan^2 x$  for all  $x \in \left( -\frac{\pi}{2}, \frac{\pi}{2} \right)$ . Then the correct expression (s) is (are) (a)

$$\int_0^{\frac{\pi}{4}} x f(x) dx = \frac{1}{12} \quad (b) \quad \int_0^{\frac{\pi}{4}} f(x) dx = 0 \quad (c) \quad \int_0^{\frac{\pi}{4}} x f(x) dx = \frac{1}{6} \quad (d)$$

$$\int_0^{\frac{\pi}{4}} f(x) dx = \frac{1}{12}$$

$$A. \int_0^{\frac{\pi}{4}} x f(x) dx = \frac{1}{12}$$

$$B. \int_0^{\frac{\pi}{4}} x f(x) dx = 0$$

$$C. \int_0^{\frac{\pi}{4}} x f(x) dx = \frac{1}{6}$$

$$D. \int_0^{\frac{\pi}{4}} f(x) dx = 1$$

**Answer: A,B**



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20. If  $\alpha = \int_0^1 \left( e^{9x+3 \tan^{-1} x} \right) \left( \frac{12+9x^2}{1+x^2} \right) dx$  where  $\tan^{-1} x$  takes only principal values, then, find the value of  $\left( (\log)_e |1+\alpha| - \frac{3\pi}{4} \right)$

A. 9

B. 8

C. 7

D. 6

**Answer: A**



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21. The value of  $\int_0^{\pi} |\cos x| dx$ , is

A. 1

B. 2

C. 0

D. 4

**Answer: B**



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22.  $\int_0^2 |x^2 + 2x - 3| dx$  is equal to

A. 4

B. 6

C. 3

D. 2

**Answer: A**



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23.  $\int_0^3 [x] dx$  is equal to

A. 2

B. 4

C. 3

D. 1

**Answer: C**



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24.  $\int_0^{1.5} [x^2] dx$  is equal to

A. 2

B.  $2 - \sqrt{2}$

C.  $2 + \sqrt{2}$

D.  $\sqrt{2}$

**Answer: B**



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25.  $\int_0^2 [x^2] dx$  is equal to

A.  $5 - \sqrt{2}$

B.  $5 - \sqrt{3} - \sqrt{2}$

C.  $5 - \sqrt{3}$

D. none of these



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26. Let  $f(x) = x - [x]$ , for every real number  $x$  (where,  $[x]$  is integral part of  $x$ ). Then, the value of  $\int_{-1}^1 f(x) dx$  is equal to



A. 1

B. 2

C. 0

D.  $1/2$

**Answer: A**



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27. If  $\{x\}$  denotes the fractional part of  $x$ , then  $\int_0^2 \{x\} dx$  is equal to

A. 1

B. 2

C.  $\frac{1}{2}$

D. 4

**Answer: A**



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28.  $\int_0^4 \{\sqrt{x}\}$  is equal to, where  $\{x\}$  denotes the fraction part of  $x$ .

A.  $\frac{2}{3}$

B.  $\frac{16}{3}$

C.  $\frac{5}{3}$

D.  $\frac{7}{3}$

**Answer: D**

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29. For any real number  $x$ , the value of  $\int_0^x [x] dx$ , is

A.  $x[x]$

B.  $x[x] - [x]([x] + 1)$

C.  $x[x] - \frac{1}{2}[x]([x] + 1)$

D. none of these

**Answer: C**

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30. If  $\{x\}$  denotes the fractional part of  $x$ , then  $\int_0^x \left( \{x\} - \frac{1}{2} \right) dx$  is equal to

- A.  $\frac{1}{2}\{x\}(\{x\} + 1)$
- B.  $\frac{1}{2}\{x\}(\{x\} - 1)$
- C.  $\{x\}(\{x\} - 1)$
- D.  $\{x\}(\{x\} + 1)$

**Answer: B**

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31. The value of :  $\int_{\pi/6}^{5\pi/6} \sqrt{4 - 4\sin^2 t} dt$ , is

A. 0

B. 2

C. 1

D. none of these

**Answer: B**



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32. If for a real number  $y$ ,  $[y]$  is the greatest integral function less, then or equal to  $y$ , then the value of the integral  $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} [2\sin x] dx$  is  $-\pi$  (b) 0 (c)

$-\frac{\pi}{2}$  (d)  $\frac{\pi}{2}$

A.  $-\pi$

B. 0

C.  $-\pi/2$

D.  $\pi/2$

**Answer: C**



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33. If  $[.]$  stands for the greatest integer function, then  $\int_1^2 [3x] dx$  is equal to

A. 3

B. 4

C. 5

D. 6

**Answer: B**



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34. The value of the integral  $\int_0^{0.9} [x - 2[x]] dx$ , where  $[.]$  denotes the greatest integer function, is

A. 0.9

B. 0

C. 1.8

D. -0.9

**Answer: B**



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35. Let  $[ \cdot ]$  denotes the greatest integer function then the value of

$$\int_0^{15} x [x^2] dx \text{ is :}$$

A.  $\frac{3}{2}$

B.  $\frac{3}{4}$

C.  $\frac{5}{4}$

D. 0

**Answer: B**



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36. The integral  $\int_0^{\pi} \sqrt{1 + 4\sin^2 \frac{x}{2} - 4\sin \frac{x}{2}} dx$  is equals to (a)  $\pi - 4$  (b)  $\frac{2\pi}{3} - 4 - \sqrt{3}$  (c)  $\frac{2\pi}{3} - 4 - \sqrt{3}$  (d)  $4\sqrt{3} - 4 - \frac{\pi}{3}$

A.  $4\sqrt{3} - 4$

B.  $4\sqrt{3} - 4 - \frac{\pi}{3}$

C.  $\pi - 4$

D.  $\frac{2\pi}{3} - 4 - 4\sqrt{3}$

**Answer: B**



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37. The value of  $\int_0^1 4x^3 \left\{ \frac{d^2}{dx^2} (1 - x^2)^5 \right\} dx$  is

A. 1

B. 2

C. 8

D. 4

**Answer: B**



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38. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a function defined by  $f(x) = \{[x], (x \leq 2) \quad (0, x > 2)$

where  $[x]$  is the greatest integer less than or equal to  $x$ . If

$$I = \int_{-1}^2 \frac{x f(x^2)}{2 + f(x+1)} dx, \text{ then the value of } (4I - 1) \text{ is}$$

A.  $\frac{1}{4}$

B.  $\frac{1}{2}$

C. 8



D.  $-\frac{1}{4}$

**Answer: A**



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39. The value of  $\int_1^a [x]f'(x)dx$ , where  $a > 1$ , and  $[x]$  denotes the greatest integer not exceeding  $x$ , is

(A)  $af(a) - \{f(1)f(2) + \dots + f([a])\}$

(B)  $[a]f(a) - \{f(1) + f(2) + \dots + f([a])\}$

(C)  $[a]f(a) - \{f(1) + f(2) + \dots + fA\}$

(D)  $af([a]) - \{f(1) + f(2) + \dots + fA\}$

A.  $af(a) - \{f(1) + f(2) + \dots + f([a])\}$

B.  $[a]f(a) - \{f(1) + f(2) + \dots + f([a])\}$

C.  $[a]f([a]) - \{f(1) + f(2) + \dots + f(a)\}$

D.  $af([a]) - \{f(1) + f(2) + \dots + f(a)\}$

**Answer: B**



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40. If  $m, n \in N$ , then

$$\int_0^{\pi/2} \frac{(\sin^m x)^{\frac{1}{n}}}{(\sin^m x)^{\frac{1}{n}} + (\cos^m x)^{\frac{1}{n}}} dx \text{ is equal to}$$

A.  $\frac{\pi}{2}$

B.  $\frac{\pi}{4}$

C.  $\frac{\pi}{2n}$

D.  $\frac{\pi}{4n}$

Answer: B



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41. Evaluate :  $\int_0^{\frac{\pi}{2}} \log(\tan x) dx$

A.  $\frac{\pi}{4}$

B.  $\frac{\pi}{2}$

C. 0

D. none of these

**Answer: C**

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42. The value of  $\int_0^{\infty} \frac{\log x}{1+x^2} dx$ , is

A.  $\frac{\pi}{4}$

B.  $\frac{\pi}{2}$

C. 0

D. none of these

**Answer: C**

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43. Evaluate  $\int_0^{\pi/4} \log(1 + \tan \theta) d\theta$

A.  $\frac{\pi}{8} \log_e 2$

B.  $\frac{\pi}{4} \log_e 2$

C.  $-\frac{\pi}{8} \log_e 2$

D.  $-\frac{\pi}{4} \log_e 2$

**Answer: A**



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44. The value of integral  $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ , is

A.  $\frac{\pi}{8} \log_e 2$

B.  $\frac{\pi}{4} \log_e 2$

C.  $-\frac{\pi}{8} \log_e 2$

D.  $-\frac{\pi}{4} \log_e 2$

**Answer: A**



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45. The value of the integral  $\int_0^a \frac{1}{x + \sqrt{a^2 - x^2}} dx$ , is

A.  $\pi$

B.  $\frac{\pi}{2}$

C.  $\frac{\pi}{4}$

D. none of these

**Answer: C**



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46. The value of  $\int_0^{\pi/2} (2 \log \sin x - \log \sin 2x) dx$ , is

A.  $\frac{\pi}{2} \log 2$

B.  $-\frac{\pi}{2} \log 2$

C.  $\pi \log 2$

D.  $-\pi \log 2$

**Answer: B**



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47. The value of  $\int_0^{\pi/2n} \frac{1}{1 + \cot nx} dx$ , is

A. 0

B.  $\frac{\pi}{4n}$

C.  $\frac{\pi}{2n}$

D.  $\frac{\pi}{2}$

**Answer: B**



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48.  $\int_0^{\pi/2} \sin 2x \log \tan x dx$  is equal to

A.  $\pi$

B.  $\frac{\pi}{2}$

C. 0

D. 1

Answer: C



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49. The value of the integral  $\int_0^{\pi} \frac{1}{e^{\cos x} + 1} dx$ , is

A.  $\pi$

B. 0

C.  $2\pi$

D.  $\frac{\pi}{2}$

**Answer: D**



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50. Evaluate:  $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$

A.  $\frac{\pi^2}{2}$

B.  $\frac{\pi^2}{4}$

C.  $\frac{\pi^2}{8}$

D.  $\frac{\pi^2}{16}$

**Answer: B**



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51. The integral  $\int_0^{\pi} x f(\sin x) dx$  is equal to

A.  $\frac{\pi}{2} \int_0^{\pi} f(\sin x) dx$



B.  $\frac{\pi}{4} \int_0^{\pi} (\sin x) dx$

C.  $\frac{\pi}{2} \int_0^{\pi/2} (\sin x) dx$

D.  $\frac{\pi}{2} \int_0^{\pi/2} f(\cos x) dx$

**Answer: A**



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52.  $\int_0^{\pi} [\cot x] dx$ , where  $[.]$  denotes the greatest integer function, is equal to

A.  $\frac{\pi}{2}$

B. 1

C. -1

D.  $-\frac{\pi}{2}$

**Answer: B**

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53. The value of the integral

$$\int_{-1/2}^{1/2} \cos x \log\left(\frac{1+x}{1-x}\right) dx, \text{ is}$$

A. 0

B.  $\frac{1}{2}$

C.  $-\frac{1}{2}$

D. none of these

**Answer: A**

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54. The value of  $\int_{-1}^1 \left\{ \sqrt{1+x+x^2} - \sqrt{1-x+x^2} \right\} dx$ , is

A. 0

B. 1

C. -1

D. none of these

**Answer: A**



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55. The value of  $\frac{\left\{ \int_{-1/2}^{1/2} \cos 2x \cdot \log\left(\frac{1+x}{1-x}\right) dx \right\}}{\left\{ \int_0^{1/2} \cos 2x \cdot \log\left(\frac{1+x}{1-x}\right) dx \right\}}$  is

A. 0

B. 4

C. 2

D. 8

**Answer: A**



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56. The value of  $\int_{-2}^2 (ax^3 + bx + c) dx$  depends on

A. B

B. C

C. A

D. none of these

**Answer: B**



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57. The value of the integral

$$\int_{-1}^1 \log(x + \sqrt{x^2 + 1}) dx \text{ is}$$

A. 0

B.  $\log 2$

C.  $\log 1/2$

D. none of these

**Answer: A**



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58. Evaluate:  $\int_{-\frac{3\pi}{2}}^{-\frac{\pi}{2}} [(x + \pi)^3 + \cos^2(x + 3\pi)] dx$

A.  $\frac{\pi^4}{32}$

B.  $\frac{\pi^4}{32} + \frac{\pi}{2}$

C.  $\frac{\pi}{2}$

D.  $\frac{\pi}{4} - 1$

**Answer: C**



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59.  $\int_{-2}^0 \{x^3 + 3x^2 + 3x + 3 + (x + 1)\cos(x + 1)\} dx$  is equal to

A. 0

B. 3

C. 4

D. 1

**Answer: C**



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60.  $\int_{-\pi/2}^{\pi/2} \frac{1}{e^{\sin x} + 1} dx$  is equal to

A. 0

B. 1

C.  $-\frac{\pi}{2}$

D.  $\frac{\pi}{2}$

**Answer: D**



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61. The value of  $\int_{-\pi/4}^{\pi/4} \frac{e^x \sec^2 x}{e^{2x} - 1} dx$ , is

- A. 0
- B. 2
- C. 4
- D. none of these

**Answer: A**

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62. Evaluate :  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1 + e^x} dx$

- A. 0
- B. -1
- C. 1
- D. none of these

Answer: C



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63. The value of  $\int_{-\pi/2}^{\pi/2} \frac{\sin^2 x}{1 + 2^x} dx$  is

A.  $\frac{\pi^2}{4} - 2$

B.  $\frac{\pi^2}{4} + 2$

C.  $\pi^2 + e^{\pi/2}$

D. 0

Answer: A



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64. The value of  $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x} dx, a > 0$ , is

A.  $\pi$



B.  $a\pi$

C.  $\pi/2$

D.  $2\pi$

**Answer: C**



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65.  $\int_{-\pi}^{\pi} \frac{e^{\sin x}}{e^{\sin x} + e^{-\sin x}} dx$  is equal to

A.  $\frac{\pi}{2}$

B.  $2\pi$

C.  $\pi$

D.  $\frac{\pi}{4}$

**Answer: C**



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66. The value of  $\int_{-2}^2 \frac{3x^2}{1+e^x} dx$ , is

A. 8

B. 2

C. 4

D. 0

**Answer: A**



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67. The value of  $\int_0^{2\pi} \cos^5 x dx$ , is

A. 0

B.  $\pi$

C.  $2\pi$

D.  $\pi/2$

**Answer: A**



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68. If  $\int_0^{\pi} x f(\sin x) dx = A \int_0^{\frac{\pi}{2}} f(\sin x) dx$ , then  $A$  is

(A)  $\frac{\pi}{2}$

(B)  $\pi$

(C)  $0$

(D)  $2\pi$

A.  $2\pi$

B.  $\pi$

C.  $\pi/4$

D.  $0$

**Answer: B**



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69. The value of  $\int_0^{\pi} \cos^{11} x dx$ , is

- A.  $\pi$
- B.  $11\pi$
- C. 0
- D.  $-11\pi$

**Answer: C**

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70.  $I = \int_0^{2\pi} \frac{1}{1 + e^{\sin x}} dx$  is equal to

- A.  $\pi$
- B.  $2\pi$
- C.  $\frac{\pi}{2}$
- D. none of these

**Answer: A**



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71. Prove that:  $\int_0^{2\pi} \frac{x \sin^{2n} x}{\sin^{2n} + \cos^{2n} x} dx$

A.  $\pi$

B.  $2\pi$

C.  $\pi^2$

D.  $\frac{1}{2}\pi^2$

**Answer: C**



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72. If  $[x]$  stands for the greatest integer function, then

$\int_4^{10} \frac{[x^2] dx}{[x^2 - 28x + 196] + [x^2]}$  is

A. 0

B. 1

C. 3

D. none of these

**Answer: C**



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73. The value of  $\int_{\sqrt{\ln 2}}^{\sqrt{\ln 3}} \frac{x \sin x^2}{\sin x^2 + \sin(\ln 6 - x^2)} dx$  is

A.  $\frac{1}{4} \ln \frac{3}{2}$

B.  $\frac{1}{2} \ln \frac{3}{2}$

C.  $\ln \frac{3}{2}$

D.  $\frac{1}{6} \ln \frac{3}{2}$

**Answer: A**



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74. The integral  $\int_2^4 \frac{\log x^2}{\log x^2 + \log(36 - 12x + x^2)} dx$  is equal to

- A. 1
- B. 6
- C. 2
- D. 4

**Answer: A**



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75.  $\int_{\pi/4}^{3\pi/4} \frac{dx}{1 + \cos x}$  is equal to

- A. 4
- B. -1
- C. -2

D. 2

Answer: D



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76. If  $f(x) = \frac{e^x}{1 + e^x}$ ,  $I_1 = \int_{f(-a)}^{f(a)} xg(x(1-x))dx$ , and  $I_2 = \int_{f(-a)}^{f(a)} g(x(1-x))dx$ , then the value of  $\frac{I_2}{I_1}$  is

A. -1

B.  $1/2$

C. 2

D. 1

Answer: C



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77. If  $f(x)=f(a+b-x)$ , then  $\int_a^b x f(x) dx$  is equal to

A.  $(a + b) \int_a^b f(x) dx$

B.  $\frac{1}{2}(a + b) \int_a^b f(x) dx$

C.  $(b - a) \int_a^b f(x) dx$

D.  $\frac{1}{2}(b - a) \int_a^{b-a} f(x) dx$

**Answer: B**



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78. Evaluate the integral  $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\tan x}}$

A.  $\frac{\pi}{3}$

B.  $\frac{\pi}{6}$

C.  $\frac{\pi}{12}$

D. 0

**Answer: C**



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79.  $I = \int_{\pi/5}^{3\pi/10} \frac{\sin x}{\sin x + \cos x} dx$  is equal to

A.  $(\pi)$

B.  $\frac{\pi}{2}$

C.  $\frac{\pi}{4}$

D. none of these

**Answer: D**



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80. Find the value of integral  $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x} + \sqrt{x}} dx$ .

A.  $\frac{1}{2}$

B.  $\frac{3}{2}$

C. 2

D. 1

**Answer: B**

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81. Evaluate  $\int_{-4}^{-5} e^{(x+5)^2} dx + 3 \int_{1/3}^{2/3} e^{9\left(x-\frac{2}{3}\right)^2} dx$ .

A. 1

B. 0

C. -1

D. none of these

**Answer: B**

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82. The value of the integral

$$\int_0^{400\pi} \sqrt{1 - \cos 2x} dx, \text{ is}$$

A.  $200\sqrt{2}$

B.  $400\sqrt{2}$

C.  $800\sqrt{2}$

D. none of these

**Answer: C**



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83. If  $n \in N$ , then  $\int_0^n (x - [x]) dx$  is equal to

A.  $n$

B.  $n/2$

C.  $2n$

D. none of these

**Answer: B**



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84. The value of  $\int_0^{100} e^{x - [x]} dx$ , is

A.  $100e$

B.  $100(e-1)$

C.  $100(e+1)$

D. none of these

**Answer: B**



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85. The value of  $\int_0^{32\pi/3} \sqrt{1 + \cos 2x} dx$  is

A.  $\frac{44 + \sqrt{3}}{\sqrt{2}}$

B.  $\frac{44 - \sqrt{3}}{\sqrt{2}}$

C.  $\frac{22 - \sqrt{3}}{\sqrt{2}}$

D.  $\frac{22 + \sqrt{3}}{\sqrt{2}}$

**Answer: B**



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86. The value of  $\int_0^{[x]} (x - [x]) dx$ , where  $[x]$  is the greatest integer of  $x$  is

equal to

A.  $[x]$

B.  $2[x]$

C.  $(1/2)[x]$

D. none of these

**Answer: C**

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87.  $\frac{d}{dx} \left( \int_{x^2}^{(x^3)^{\frac{1}{\log t}}} dt \right)$  is equal to

A.  $x^2 - x$

B.  $(x^2 - x) \log x$

C.  $\frac{x^2 - x}{\log x}$

D.  $\frac{x - 1^2}{\log x}$

**Answer: C**

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88. If  $g(x) = \int_{\sin x}^{\sin(2x)} \sin^{-1}(t) dt$ , then:

(a)  $g'(\frac{\pi}{2}) = -2\pi$  (b)  $g'(-\frac{\pi}{2}) = -2\pi$  (c)  $g'(-\frac{\pi}{2}) = 2\pi$  (d)  $g'(\frac{\pi}{2}) = 2\pi$

A.  $g'(\frac{\pi}{2}) = -2\pi$

B.  $g'(-\frac{\pi}{2}) = 2\pi$

C.  $g'(\frac{\pi}{2}) = 0$

D.  $g'(-\frac{\pi}{2}) = 0$

Answer: C::D

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89. If  $\phi(x) = \int_{1/x}^{\sqrt{x}} \sin(t^2) dt$  then  $\phi'(1)$  is equal to

A.  $\sin 1$

B.  $2 \sin 1$



C.  $(3/2)\sin 1$

D. none of these

**Answer: C**



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90.  $\lim_{x \rightarrow \infty} \frac{\int_0^{2x} te^{t^2} dt}{e^{4x^2}}$  equals

A. 0

B. 2

C.  $\frac{1}{2}$

D.  $\infty$

**Answer: C**



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91. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a differentiable function having  $f(2) = 6$ ,  $f'(2) = \frac{1}{48}$ .

Then evaluate  $\lim_{x \rightarrow 2} \int_6^{f(x)} \frac{4t^3}{x-2} dt$

A. 18

B. 12

C. 36

D. 24

**Answer: A**



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92.  $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\int_2^{\sec^2 x} f(t) dt}{x^2 - \frac{\pi^2}{16}}$  is equal to

A.  $\frac{8}{\pi} f(2)$

B.  $\frac{2}{\pi} f(2)$

C.  $\frac{2}{\pi} f\left(\frac{1}{2}\right)$

D.  $4f(2)$

**Answer: A**



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93. If  $\int_{\sin x}^1 t^2 f(t) dt = 1 - \sin x$ , where  $x \in \left(0, \frac{\pi}{2}\right)$ , then find the value of  $f\left(\frac{1}{\sqrt{3}}\right)$ .

A. 3

B.  $\sqrt{3}$

C.  $\frac{1}{3}$

D. none of these

**Answer: A**



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94. If  $y = \int_0^x f(t) \sin\{k(x-t)\} dt$ , then prove that  $\frac{d^2y}{dx^2} + k^2y = kf(x)$ .

A.  $f(x)$

B.  $k f(x)$

C.  $k^2 f(x)$

D. none of these

**Answer: B**



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95. Find out the area bounded by the curve

$$y = \int_{1/8}^{\sin^2 x} (\sin^{-1} \sqrt{t}) dt + \int_{1/8}^{\cos^2 x} (\cos^{-1} \sqrt{t}) dt \quad (0 \leq x \leq \pi/2) \quad \text{and}$$

the curve satisfying the differential equation

$$y(x + y^3) dx = x(y^3 - x) dy \text{ passing through } (4, -2).$$

A.  $\pi$

B.  $\frac{\pi}{2}$

C.  $\frac{\pi}{4}$

D. none of these

**Answer: C**

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96. Let  $f: (0, \infty) \in \mathbb{R}$  be given

$$f(x) = \int_{1/x}^x e^{t+\frac{1}{t}} \frac{1}{t} dt, \text{ then}$$

A.  $f(x)$  is monotonically increasing on  $[1, \infty]$

B.  $f(x)$  is monotonically increasing on  $(0,1)$

C.  $f(x)$  is monotonically decreasing on  $(0,1)$

D.  $f(2^x)$  is an odd function of  $x$  on  $\mathbb{R}$

**Answer: A::C::D**

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97. Let  $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$  and  $J = \int_0^1 \frac{\cos x}{\sqrt{x}} dx$

Then , which one of the following is true ?

A.  $I > \frac{2}{3}$  and  $J > 2$

B.  $I < \frac{2}{3}$  and  $J < 2$

C.  $I < \frac{2}{3}$  and  $J > 2$

D.  $I > \frac{2}{3}$  and  $J < 2$

**Answer: B**



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98. The value of the integral  $\int_0^1 e^{x^2} dx$  lies in the interval

A. (0,1)

B. (-1,0)

C. (1, e)

D. none of these

**Answer: C**



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99. The smallest interval  $[a, b]$  such that

$$\int_0^1 \frac{1}{\sqrt{1+x^4}} dx \in [a, b], \text{ is}$$

A.  $[1/\sqrt{2}, 1]$

B.  $[0, 1]$

C.  $[1/2, 1]$

D.  $[3/4, 1]$

**Answer: A**



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100. If  $I = \int_0^1 \frac{1}{1+x^{\pi/2}} dx$  then

A.  $\ln 2 < 1 < \frac{\pi}{4}$

B.  $I < \ln 2$

C.  $\ln 2 > \frac{\pi}{4}$

D. none of these

**Answer: A**



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101. Let  $f(a) > 0$ , and let  $f(x)$  be non-decreasing continuous function in

$[a, b]$ , Then  $\frac{1}{b-a} \int_a^b f(x) dx$  has the :

A. maximum value  $f(b)$  and minimum value  $f(a)$

B. maximum value  $b f(b)$  and minimum value  $a f(a)$

C. maximum value  $f(a)$  and minimum value  $f(b)$



D. none of these

**Answer: A**

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102. If  $I \sum_{k=1}^{98} \int_k^{k+1} \frac{k+1}{x(x+1)} dx$ , then: (a)  $I < \frac{49}{50}$  (b)  $I > (\log)_e 99$  (c)  $I > \frac{49}{50}$  (d)  $I < (\log)_e 99$

A.  $I > \log_e 99$

B.  $I < \log_e 99$

C.  $I < \frac{49}{50}$

D.  $I > \frac{49}{50}$

**Answer: B::D**

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103. Let  $f: \left[\frac{1}{2}, 1\right] \rightarrow \mathbb{R}$  (the set of all real numbers) be a positive, non-constant, and differentiable function such that  $f'(x) < 2f(x)$  and  $f\left(\frac{1}{2}\right) = 1$ . Then the value of  $\int_{\frac{1}{2}}^1 f(x) dx$  lies in the interval (a)  $(2e - 1, 2e)$  (b)  $(3 - 1, 2e - 1)$  (c)  $\left(\frac{e - 1}{2}, e - 1\right)$  (d)  $\left(0, \frac{e - 1}{2}\right)$

A.  $(2e-1, 2e)$

B.  $e-1, 2e-1)$

C.  $\left(\frac{e - 1}{2}, e - 1\right)$

D.  $\left(0, \frac{e - 1}{2}\right)$

Answer: D

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104. Let  $f'(x) = \frac{192x^3}{2 + \sin^4 \pi x}$  for all  $x \in \mathbb{R}$  with  $f\left(\frac{1}{2}\right) = 0$ . If  $m \leq \int_{\frac{1}{2}}^1 f(x) dx \leq M$ , then the possible values of  $m$  and  $M$  are-

A.  $m=13, M=24$

B.  $m = \frac{1}{4}, M = \frac{1}{2}$

C.  $m=-11, M=0$

D.  $m=1, M=12$

**Answer: D**

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**105.** Let  $f: R \rightarrow R$  be a continuous function which satisfies  $f(x) =$

$\int_0^x f(t) dt$ . Then the value of  $f(1n5)$  is \_\_\_\_\_

A. 5

B. 0

C. 1

D. -5

**Answer: B**



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106. The least value of the function  $\phi(x) = \int_{5\pi/4}^x (3 \sin t + 4 \cos t) dt$  on the interval  $\left( \left[ \frac{5\pi}{4}, \frac{4\pi}{3} \right] \right)$  is

A.  $\sqrt{3} + \frac{3}{2}$

B.  $-2\sqrt{3} + \frac{3}{2} + \frac{1}{\sqrt{2}}$

C.  $\frac{3}{2} + \frac{1}{\sqrt{2}}$

D. none of these

Answer: B



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107.  $\lim_{n \rightarrow \infty} \sum_{r=1}^n \frac{1}{n} e^{r/n}$  is

A.  $e+1$

B.  $e^{-1}$

C.  $1-e$

D.  $e$

**Answer: B**



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108.  $\lim_{n \rightarrow \infty} \sum_{2n+1}^{3n} \frac{n}{r^2 - n^2}$  is equal to :

A.  $\ln \sqrt{\frac{2}{3}}$

B.  $\ln \sqrt{\frac{3}{2}}$

C.  $\ln \frac{2}{3}$

D.  $\ln \frac{3}{2}$

**Answer: B**



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109. The value of  $\lim_{n \rightarrow \infty} \frac{1}{n} \cdot \sum_{r=1}^{2n} \frac{r}{\sqrt{n^2 + r^2}}$  is equal to

A.  $1 + \sqrt{5}$

B.  $-1 + \sqrt{5}$

C.  $-1 + \sqrt{2}$

D.  $1\sqrt{2}$

**Answer: B**



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110.  $\lim_{n \rightarrow \infty} \left\{ \frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{n+n} \right\}$  is, equal to

A.  $\log_e 3$

B. 0

C.  $\log_e 2$

D. 1

Answer: C



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111.  $\lim_{n \rightarrow \infty} \left\{ \frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \dots + \frac{n}{n^2 + n^2} \right\}$  is equal to

A. 1

B. 0

C.  $\frac{\pi}{4}$

D.  $\frac{\pi}{2}$

Answer: C



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112.  $\lim_{n \rightarrow \infty} \left\{ \frac{1^m + 2^m + 3^m + \dots + n^m}{n^{m+1}} \right\}$  equals

A.  $\frac{1}{m+1}$

B.  $\frac{1}{m+2}$

C.  $\frac{1}{m}$

D. none of these

**Answer: A**



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113.  $\lim_{n \rightarrow \infty} \frac{(n!)^{1/n}}{n}$  equals

A.  $e$

B.  $e^{-1}$

C. 1

D. none of these

**Answer: B**



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114.  $\lim_{n \rightarrow \infty} \left\{ \frac{1}{n} + \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{3n} \right\} =$

A. log2

B. log3

C. log5

D. 0

**Answer: B**



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115. Evaluate the following limit:

$$\lim_{n \rightarrow \infty} \left[ \frac{1}{n^2} \sec^2 \frac{1}{n^2} + \frac{2}{n^2} \sec^2 \frac{4}{n^2} + \dots + \frac{1}{n} \sec^2 1 \right]$$

A.  $\frac{1}{2} \tan 1$

B.  $\tan 1$

C.  $\frac{1}{2} \operatorname{cosec} 1$

D.  $\frac{1}{2} \sec 1$

**Answer: A**



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116.  $\lim_{n \rightarrow \infty} \left( \frac{(n+1)(n+2)(n+3)\dots 2n}{n^{2n}} \right)^{\frac{1}{n}}$  is equal to

A.  $\frac{18}{e^4}$

B.  $\frac{27}{e^2}$

C.  $\frac{9}{e^2}$

D.  $3 \log 3 - 2$

**Answer: C**



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117. For  $a \in \mathbb{R}$  (the set of all real numbers)

$$a \neq -1, \lim_{n \rightarrow \infty} \frac{(1^a + 2^a + \dots + n^a)}{(n+1)^{a-1} [(na+1) + (n+2) + \dots + (na+n)]}$$

Then  $a =$

A. 5,7

B. 7,  $\frac{17}{2}$

C.  $-\frac{15}{2}$ ,  $-\frac{17}{2}$

D. 7,  $\frac{15}{2}$

**Answer: B**



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118. Let  $S_n = \sum_{k=1}^n \frac{n}{n^2 + kn + k^2}$  and  $T_n = \sum_{k=0}^{n-1} \frac{n}{n^2 + kn + k^2}$  for

$n = 1, 2, 3, \dots$ . Then

A.  $S_n < \frac{\pi}{3\sqrt{3}}, T_n > \frac{\pi}{3\sqrt{3}}$

B.  $S_n \geq \frac{\pi}{3\sqrt{3}}, T_n < \frac{\pi}{3\sqrt{3}}$

$$C. S_n > \frac{\pi}{3\sqrt{3}}, T_n > \frac{\pi}{3\sqrt{3}}$$

$$D. S_n < \frac{\pi}{3\sqrt{3}}, T_n < \frac{\pi}{3\sqrt{3}}$$

**Answer: A**



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119. The value of  $\int_{-\pi}^{\pi} \sin^3 x \cos^2 x dx$  is.....

A.  $\frac{3\pi}{216}$

B.  $\frac{3\pi}{512}$

C.  $\frac{\pi}{512}$

D. none of these



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120. The value of  $\int_{-1}^1 (x|x|) dx$  is equal to

A. 0

B. 1

C.  $-1$

D.  $1/2$

**Answer: B**

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121. The value of  $\int_0^x d[t]$ , is

A.  $x$

B.  $x^2/2$

C.  $-x$

D.  $[x]$

**Answer: D**

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122. The value of  $\int_0^2 x d([x] - x)$ , is

A.  $1/2$

B. 1

C.  $-1$

D. 0

**Answer: B**



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123. The value of the integral  $\int_0^3 (x^2 + 1) d[x]$  is, where  $[*]$  is the greatest integer function

A. 12

B. 15

C. 17

D. 19

**Answer: C**



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## Section I - Solved Mcqs

1.  $\int_0^{10} |x(x-1)(x-2)| dx$  is equal to

A. 160.05

B. 1600.5

C. 16.005

D. none of these

**Answer: B**



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2. If  $\int_0^x f(t)dt = x + \int_x^1 tf(t)dt$ , then the value of  $f(1)$ , is

A.  $1/2$

B. 0

C. 1

D.  $-1/2$

**Answer: A**



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3. Let  $f$  be a positive function. Let  $I_1 = \int_{1-k}^k xf[x(1-x)]dx$ ,  
 $I_2 = \int_{1-k}^k f[x(1-x)]dx$ , where  $2k - 1 > 0$ . Then  $\frac{I_1}{I_2}$  is

A. 2

B.  $k$



C.  $1/2$

D. 1

**Answer: C**



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4. If  $g(x) = \int_0^x \cos^4 t dt$ , then  $g(x + \pi)$  equals to (a)  $\frac{g(x)}{g(\pi)}$  (b)  $g(x) + g(\pi)$  (c)  $g(x) - g(\pi)$  (d)  $g(x) \cdot g(\pi)$

A.  $g(x) + g(\pi)$

B.  $g(x) - g(\pi)$

C.  $g(x)g(\pi)$

D.  $g(x) / g(\pi)$

**Answer: A**



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5. If  $I_n = \int_0^{\pi/4} \tan^n x dx$ ,  $n \in \mathbb{N}$  then  $I_{n+2} + I_n$  equals

A.  $\frac{1}{n}$

B.  $\frac{1}{n-1}$

C.  $\frac{1}{n+1}$

D.  $\frac{1}{n+2}$

**Answer: C**

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6. If  $\Rightarrow I_n = \int_0^{\pi/4} \tan^n x dx$ , then for any positive integer,  $n$ , the value of  $n(I_{n+1} + I_{n-1})$  is,

A. 1

B. 2

C.  $\pi/4$

D.  $\pi$

**Answer: A**



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7. Find the value of  $\int_{-1}^1 \frac{d}{dx} \left( \tan^{-1} \left( \frac{1}{x} \right) \right) dx$

A.  $\pi/2$

B.  $-\pi/4$

C.  $-\pi/2$

D. none of these

**Answer: A**



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8. The value of the integral

$\int_{-1}^3 \left( \tan^{-1} \frac{x}{x^2 + 1} + \tan^{-1} \frac{x^2 + 1}{x} \right) dx$  is equal to

A.  $\pi$

B.  $2\pi$

C.  $4\pi$

D. none of these

**Answer: B**

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9. If  $I = \int_1^e (\log x)^n dx$ , then  $I_n + nI_{n-1}$  is equal to

A.  $1/e$

B.  $e$

C.  $e - 1$

D. none of these

**Answer: B**

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10. If  $I_n = \int_0^1 x^n e^{-x} dx$  for  $n \in \mathbb{N}$  then  $I_n - nI_{n-1} =$

A.  $e$

B.  $1/e$

C.  $-1/e$

D. none of these

**Answer: C**



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11. The value of  $\int_{1/n}^{(an-1)/n} \frac{\sqrt{x}}{\sqrt{a-x} + \sqrt{x}} dx$ , is

A.  $\frac{a}{2}$

B.  $\frac{1}{2n}(na + 2)$

C.  $\frac{na - 2}{2n}$

D. none of these

**Answer: C**

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12. The value of the integral  $\int_0^{\pi/2} \log|\tan x \cot x| dx$  is

A.  $\pi \log 2$

B.  $-\pi \log 2$

C.  $\frac{\pi}{2} \log 2$

D. none of these

**Answer: D**

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13. If  $I_1 = \int_x^1 \frac{1}{1+t^2} dt$  and  $I_2 = \int_1^{1/x} \frac{1}{1+t^2} dt$  for  $x > 0$  then,

A.  $I_1 = I_2$

B.  $I_1 > I_2$

C.  $I_2 = I_1$

D. none of these

**Answer: A**

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14. The value of  $\int_{\frac{1}{e} \rightarrow \tan x} \frac{t dt}{1 + t^2} + \int_{\frac{1}{e} \rightarrow \cot x} \frac{dt}{t \cdot (1 + t^2)} =$

A. 0

B. 1

C. e

D. none of these

**Answer: B**

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15. The absolute value of  $\int_{10}^{19} \frac{\cos x}{1+x^8} dx$ , is

- A. less than  $10^{-7}$
- B. more than  $10^{-7}$
- C. less than  $10^{-8}$
- D. none of these

**Answer: A**



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16. If  $f(x)$  is an odd periodic function defined on the interval  $[-T/2, T/2]$ , where

$T$  is the period of  $f(x)$ . Then  $\phi(x) = \int_a^x f(t) dt$ , is

- A. periodic with period  $T$
- B. non-periodic



C. periodic with period  $2T$

D. periodic with period  $aT$

**Answer: A**

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17. If  $\int_{\pi/2}^{\theta} \sin x dx = \sin 2\theta$  then the value of  $\theta$  satisfying  $0 < \theta < \pi$ , is

A.  $3\pi/2$

B.  $\pi/6$

C.  $5\pi/6$

D.  $\pi/2$

**Answer: D**

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18. If  $f(x)$  is periodic function with period,  $T$ , then

$$\text{A. } \int_a^b f(x) dx = \int_a^{b+T} f(x) dx$$

$$\text{B. } \int_a^b f(x) dx = \int_{a+T}^b f(x) dx$$

$$\text{C. } \int_a^b f(x) dx = \int_{a+T}^{b+T} f(x) dx$$

$$\text{D. } \int_a^b f(x) dx = \int_{a+T}^{b+2T} f(x) dx$$

**Answer: C**



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19. The value of  $\lim_{n \rightarrow \infty} \frac{1}{n} \{(n+1)(n+2)(n+3)\dots(n+n)\}^{1/n}$  is

equal to

A.  $e$

B.  $1/e$

C.  $2/e$

D.  $4/e$

**Answer: D**

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20. The points of extremum of  $\phi(x) = \int_1^x e^{-t^2/2} (1 - t^2) dt$  are

A.  $x = 1, -1$

B.  $x = -1, 2$

C.  $x = 2, 1$

D.  $x = -2, 1$

**Answer: A**

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21.  $\int_{-2}^2 \min(x - [x], -x - [x]) dx$  equals, where  $[x]$  represents greatest integer less than or equal to  $x$ .

A. 2

B. 1

C. 4

D. 0

**Answer: B**



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22. The integral  $\int_0^a \frac{g(x)}{f(x) + f(a-x)} dx$  vanishes, if

A.  $g(x)$  is odd

B.  $f(x) = f(a-x)$

C.  $g(x) = -g(a-x)$

D.  $f(a-x)g=g(x)$

**Answer: C**



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23. If  $\frac{1}{\sqrt{a}} \int_1^a \left( \frac{3}{2} \sqrt{x} + 1 - \frac{1}{\sqrt{x}} \right) dx < 4$  then 'a' may take values :

A. 0

B. 4

C. 9

D. none of these

**Answer: D**



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24. Evaluate  $\frac{\int_0^n [x] dx}{\int_0^n \{x\} dx}$  (where  $[x]$  and  $\{x\}$  are integral and fractional parts of  $x$  respectively and  $n \in \mathbb{N}$ ).

A.  $\frac{1}{n-1}$

B.  $\frac{1}{n}$

C.  $n$

D.  $n-1$

**Answer: D**

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25. If  $f(x) = \min \{|x-1|, |x|, |x+1|\}$ , then the value of  $\int_{-1}^1 f(x) dx$

is equal to

A. 1

B. 2

C. 0

D. none of these

**Answer: D**



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26. The value of  $\int_0^{100} [\tan^{-1} x] dx$  is equal to (where  $[.]$  denotes the greatest integer function)

A. 100

B.  $100 - \tan^{-1} 1$

C.  $100 - \tan 1$

D. none of these

**Answer: C**



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27. The value of  $\int_{-1}^{10} \operatorname{sgn}(x - [x]) dx$  is equal to (where,  $[.]$  denotes the greatest integer function)

A. 10

B. 11

C. 9

D.  $11/2$

**Answer: B**



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28. If  $n \in \mathbb{N}$ , then  $\int_{-n}^n (-1)^{[x]} dx$  equals

A.  $2n$

B.  $n$

C.  $n^2$

D. none of these



**Answer: D**



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29. The value of  $\therefore \int_0^{[x]} \frac{2^x}{2^{[x]}} dx$  is

A.  $\log 2$

B.  $\frac{[x]}{\log 2}$

C.  $\frac{1}{2} \frac{[x]}{\log 2}$

D. none of these

**Answer: B**



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30. If  $f(x)$  is a function satisfying  $f\left(\frac{1}{x}\right) + x^2 f(x) = 0$  for all non zero  $x$

then,  $\int_{\sin \theta}^{\operatorname{cosec} \theta} f(x) dx$  equals

A.  $\sin \theta + \operatorname{cosec} \theta$

B.  $\sin^2 \theta$

C.  $\operatorname{cosec}^2 \theta$

D. none of these

**Answer: D**

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31. If  $f(x) = \begin{cases} e^{\cos x} \sin x & |x| \leq 2 \\ 2 & \text{otherwise} \end{cases}$ . Then  $\int_{-2}^3 f(x) dx = \underline{\hspace{2cm}}$

A. 0

B. 1

C. 2

D. 3

**Answer: C**

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32. The value of the integral  $\int_{e^{-1}}^{e^2} \left| \frac{\ln x}{x} \right| dx$  is:

A.  $\frac{3}{2}$

B.  $\frac{5}{2}$

C. 3

D. 5

**Answer: B**



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33. about to only mathematics

A.  $-\frac{3}{2} \leq g(2) < \frac{1}{2}$

B.  $0 \leq g(2) \leq 2$

C.  $\frac{3}{2} \leq g(2) \leq \frac{5}{2}$

$$D. 2 < g(2) < 4$$

**Answer: B**



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34. Let  $f: (0, \infty) \rightarrow \mathbb{R}$  and  $F(x) = \int_0^x f(t)dt$ . If  $F(x^2) = x^2(1+x)$ ,

then  $f(4)$  is equal to

A.  $5/4$

B. 7

C. 4

D. 2

**Answer: C**



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35. The integral  $\int_{-\frac{1}{2}}^{\frac{1}{2}} \left( [x] + 1n\left(\frac{1+x}{1-x}\right) \right) dx$  is equal to (where  $[.]$  represents the greatest integer function)

A.  $-\frac{1}{2}$

B. 0

C. 1

D.  $2\ln\left(\frac{1}{2}\right)$

**Answer: A**



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36. Let  $T > 0$  be a fixed real number. Suppose  $f$  is continuous function such that for all  $x \in R$ ,  $f(x + T) = f(x)$ . If  $I = \int_0^T f(x) dx$ , then the value of  $\int_3^{3+3T} f(2x) dx$  is  $\frac{3}{2}I$  (b)  $2I$  (c)  $3I$  (d)  $6I$

A.  $\frac{3}{2}I$

B. 2I

C. 3I

D. 6I

**Answer: C**



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37. Let  $f(x) = \int_1^x \sqrt{2-t^2} dt$ . Then the real roots of the equation  $x^2 - f'(x) = 0$  are  $\pm 1$  (b)  $\pm \frac{1}{\sqrt{2}}$   $\pm \frac{1}{2}$  (d) 0 and 1

A.  $\pm 1$

B.  $\pm \frac{1}{\sqrt{2}}$

C.  $\pm \frac{1}{2}$

D. 0 and 1

**Answer: A**



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38. If  $f\left(\frac{1}{x}\right) + x^2 f(x) = 0$ ,  $x > 0$  and  $I = \int_{1/x}^x f(t) dt$ ,  $\frac{1}{2} \leq x \leq 2x$ ,

then I is equal to

A.  $f(2) - f\left(\frac{1}{2}\right)$

B.  $f\left(\frac{1}{2}\right) - f(2)$

C. 0

D. none of these

Answer: C



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39. If  $\left| \int_a^b f(x) dx \right| = \int_a^b |f(x)| dx$ ,  $a < b$ , then  $f(x) = 0$  has

A. exactly one root in (a,b)

B. at least one root in (a,b)

C. no root in (a,b)

D. none of these

**Answer: C**



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**40.** Let  $f(x)$  be an odd continuous function which is periodic with period 2.

If  $g(x) = \int_0^x f(t) dt$ , then

A.  $g(x)$  is an odd function

B.  $g(n) = 0$  for all  $n \in \mathbb{N}$

C.  $g(2n) = 0$  for all  $n \in \mathbb{N}$

D.  $g(x)$  is non periodic

**Answer: C**



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41. All the value of d for which

$$\int_1^2 \{a^2 + (4 - 4a)x + 4x^3\} dx \leq 12 \text{ are given by}$$

A.  $a=3$

B.  $a \leq 4$

C.  $0 \leq a \leq 3$

D. none of these

**Answer: A**



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42. Let  $f(x)$  be a function defined by

$$f(x) = \int_1^x t(t^2 - 3t + 2) dt, 1 < x < 3 \text{ then the maximum value of}$$

$f(x)$  is

A.  $[0,2]$

B.  $[-1/4,4]$

C.  $[-1/4, 2]$

D. none of these

**Answer: C**

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43. If  $\int_0^x \{t\} dt = \int_0^{\{x\}} t dt$  (where  $x > 0 \notin \mathbb{Z}$  and  $\{ \cdot \}$

represents fractional part function), then

A.  $x \in (0, 1)$

B.  $[x] = 1$

C.  $x \in (1, 6) - I$

D. none of these

**Answer: A**

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44. Let  $f(x) = \max . \{x + |x|, x - [x]\}$  , where  $[x]$  denotes the greatest integer less than or equal to  $x$ , then  $\int_{-2}^2 f(x)$  is equal to

A. 3

B. 5

C. 1

D. none of these

**Answer: B**



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45.  $\Rightarrow \int_0^{\infty} \left[ \frac{2}{e^x} \right] dx$  (where  $[*]$  denotes the greatest integer function) equals

A.  $\log_e 2$

B.  $e^2$

C. 0

D.  $2/e$

**Answer: A**



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46. If  $\int_0^1 \frac{e^t dt}{t+1} = a$ , the  $\neq$  value  $\int_{b-1}^b \frac{e^{-t} dt}{t-b-1}$

A.  $ae^{-b}$

B.  $-ae^{-b}$

C.  $be^b$

D. none of these

**Answer: B**



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47. Evaluate:  $\int_{-1}^4 f(x)dx = 4$  and  $\int_2^4 (3 - f(x))dx = 7$ , then find the value of  $\int_{-1}^2 f(x)dx$ .

A. 2

B. -3

C. 5

D. none of these

**Answer: D**



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48. For  $x \in \mathbb{R}$ , and a continuous function  $f$  let

$$I_1 = \int_{\sin^2 t}^{1 + \cos^2 t} x f\{x(2 - x)\} dx \text{ and } I_2 = \int_{\sin^2 t}^{1 + \cos^2 t} f\{x(2 - x)\} dx.$$

Then  $\frac{I_1}{I_2}$  is

A. 0

B. 1

C. 2

D. 3

**Answer: B**



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49.  $\int_1^4 \log_e [x] dx$  equals

A.  $\log_e 6$

B.  $\log_e 3$

C.  $\log_e 2$

D. none of these

**Answer: A**



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50. If  $[.]$  denotes greatest integer function, then the value of

$$\int_{-\pi/2}^{\pi/2} \left( \left[ \frac{\pi}{2} \right] + \right) dx \text{ is}$$

A.  $\pi$

B.  $\pi/2$

C. 0

D.  $-\pi/2$

**Answer: C**



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51.  $\int_0^{100\pi} \left( \sum_{r=1}^{10} \tan rx \right) dx$  is equal to

A.  $100\pi$

B.  $-100\pi$

C. 1

D. none of these

**Answer: D**

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52.

If

$$I_1 = \int_0^{\pi/2} \cos(\sin x) dx, I_2 = \int_0^{\pi/2} \sin(\cos x) dx \text{ and } I_3 = \int_0^{\pi/2} \cos x dx$$

then

A.  $I_1 > I_3 > I_2$

B.  $I_3 > I_1 > I_2$

C.  $I_1 > I_2 > I_3$

D.  $I_3 > I_2 > I_1$

**Answer: A**

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53. For any  $n \in \mathbb{N}$ , the value of the integral  $\int_0^\pi \frac{\sin 2nx}{\sin x} dx$  is,

A.  $\pi$

B.  $2\pi$

C.  $-\pi$

D. none of these

**Answer: D**

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54. For any  $n \in \mathbb{N}$ ,  $\int_0^\pi \frac{\sin^2 nx}{\sin^2 x} dx$  is equal to

A.  $\pi$

B.  $n\pi$

C. 0

D. none of these

**Answer: B**



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55. For any  $n \in N$ ,  $\int_0^\pi \frac{\sin(2n + 1)x}{\sin x} dx$  is equal to

A.  $\pi$

B. 0

C.  $n\pi$

D.  $(2n + 1)\pi$

**Answer: A**



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56. If  $\int_n = \int_{-\pi}^\pi \frac{\sin nx}{(1 + \pi^x)\sin x} dx$ ,  $n = 0, 1, 2, \dots$  then

A.  $I_n = I_{n+2}$

$$B. \sum_{m=1}^{10} I_{2m+1} = 10\pi$$

$$C. \sum_{m=1}^{10} I_{2m} = 0$$

$$D. I_n = I_{n+1}$$

**Answer: D**

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57. If  $I_n = \int_0^{\pi/4} \tan^n x dx$ , then  
 $\frac{1}{I_2 + I_4}, \frac{1}{I_3 + I_5}, \frac{1}{I_4 + I_6}, \dots$  form\

A. an A.P.

B. a G.P.

C. a H.P.

D. none of these

**Answer: A**

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58. Let  $f(x)$  be a function defined on  $\mathbb{R}$  satisfying  $f(x) = f(1 - x)$  for all

$x \in \mathbb{R}$ . Then  $\int_{-1/2}^{1/2} f\left(x + \frac{1}{2}\right) \sin x dx$  equals

A.  $\int_{-1/2}^{1/2} f\left(x + \frac{1}{2}\right) \sin x dx$

B.  $2 \int_{-1/2}^{1/2} f\left(x + \frac{1}{2}\right) \sin x dx$

C.  $f(x) \sin x dx$

D. none of these

**Answer: D**



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59. Evaluate:  $5050 \frac{\int_0^1 (1 - x^{50})^{100} dx}{\int_0^1 (1 - x^{50})^{101} dx}$

A. 5049

B. 5051

C. 5050

D. none of these

**Answer: B**



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60. If  $f$  and  $g$  are continuous functions on  $[0, \pi]$  satisfying  $f(x) + f(\pi - x) = 1 = g(x) + g(\pi - x)$  then  $\int_0^\pi [f(x) + g(x)]dx$  is equal to

A.  $\pi$

B.  $2\pi$

C.  $\frac{\pi}{2}$

D.  $\frac{3\pi}{2}$

**Answer: A**



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61. If  $f(x)$  and  $g(x)$  are two continuous functions defined on  $[-a, a]$  then the

the value of  $\int_{-a}^a \{f(x) + f(-x)\}\{g(x) - g(-x)\}dx$  is,

A.  $2a$

B.  $f(a)g(a)$

C.  $a$

D. none of these

Answer: D



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62. Let  $f(x)$  be a continuous function defined on  $[0, a]$  such that

$f(a-x) = f(x)$  for all  $x \in [0, a]$ . If  $\int_0^{a/2} f(x)dx = \alpha$ , then

$\int_0^a f(x)dx$  is equal to

A.  $\alpha$

B.  $2\alpha$

C. 0

D. none of these

**Answer: B**



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63. The value of the integral  $\int_0^{\pi/2} \sin 2nx \cot x dx$ , where  $n$  is a positive integer, is

A.  $\frac{\pi}{2}$

B.  $-\pi$

C.  $\pi$

D. none of these

**Answer: A**



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64. Evaluate  $\int_1^{e^6} \left[ \frac{\log x}{3} \right] dx$ , where  $[.]$  denotes the greatest integer function.

A. 0

B.  $e^{6-e^3}$

C.  $e^6 + e^3$

D.  $e^3 - e^6$

Answer: B



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65. For any natural number  $n$ , the value of  $\Rightarrow \int_0^{n^2} [\sqrt{x}] dx$ , is

A.  $\frac{n(n+1)(4n+1)}{6}$



B.  $\frac{n(n-1)(4n+1)}{6}$

C.  $\frac{n(n-1)(4n-1)}{6}$

D. none of these

**Answer: B**



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66. The value of the integral  $\int_a^{a+\pi/2} (|\sin x| + |\cos x|) dx$  is

A.  $a\pi$

B.  $2a\pi$

C.  $\frac{a\pi}{2}$

D. independent of  $a$

**Answer: D**



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67. If  $\Rightarrow I_n = \int_a^{a+\pi/2} \frac{\cos^2 nx}{\sin x} dx$ , then  $I_2 - I_1, I_3 - I_2, I_4 - I_3$  are in

A. G.P.

B. A.P.

C. H.P.

D. none of these

**Answer: C**



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68. Let  $f(x)$  be a polynomial of degree 2 satisfying

$f(0) = 1, f(1) = -2$  and  $f''(0) = 6$ , then  $\int_{-1}^2 f(x)$  is equal to

A. 6

B. 2

C. 9

D. none of these

**Answer: C**

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69. The value of  $\int_{-2}^2 \frac{\sin^2 x}{\left[\frac{x}{\pi}\right] + \frac{1}{2}} dx$  where  $[\cdot]$  denotes greatest integer function, is

A. 1

B. 2

C.  $4 - \sin 4$

D. none of these

**Answer: B**

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70.  $f(x) = \int_0^x f(t)dt = x + \int_x^1 tf(t)dt$ , then the value of  $f(1)$  is

- A.  $1/2$
- B. 0
- C. 1
- D.  $-1/2$

**Answer: A**



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71. If  $f(x) = \int_0^{\sin x} \cos^{-1} t dt + \int_0^{\cos x} \sin^{-1} t dt$ ,  $0 < x < \frac{\pi}{2}$  then  $f(\pi/4)$  is equal to

- A.  $\frac{\pi}{\sqrt{2}}$
- B.  $1 + \frac{\pi}{2\sqrt{2}}$
- C. 1

D. none of these

**Answer: D**



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72. Let  $f(x)$  be a continuous function such that

$\int_m^{n+1} f(x) dx = n^3, n \in Z$  Then, the value of  $\int_{-30^3} f(x) dx$  is

A. 9

B.  $-27$

C.  $-9$

D. none of these

**Answer: B**



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73. Let  $f(x) = \frac{e^x + 1}{e^x - 1}$  and  $\int_0^1 x^3 \cdot \frac{e^x + 1}{e^x - 1} dx = \alpha$  Then,  $\int_{-1}^1 t^3 f(t) dt$  is equal to

A. 0

B.  $\alpha$

C.  $2\alpha$

D. none of these

**Answer: C**



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74. If  $\int_0^1 x e^{x^2} dx = \alpha \int_0^1 e^{x^2} dx$ , then

A.  $\alpha \in (0, 1)$

B.  $(1, 2)$

C.  $(-\infty, 0)$

D.  $(0, \infty)$

**Answer: A**



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75. If  $I = \int_0^1 (1 + e^{-x^2}) dx$  then, s

A.  $I = \in (1, 2)$

B.  $I \in (0, 1)$

C.  $I \in \left(1 + \frac{1}{e}, 2\right]$

D. none of these

**Answer: C**



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76. If  $I = \int_0^1 \frac{x}{8 + x^3} dx$  then the smallest interval is which I less is

A. (0,1/8)

B. (0,1/9)

C. (0,1/10)

D. (0,1/7)

**Answer: B**



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77. Let  $f: R \rightarrow R$  be a continuous function given by  $f(x + y) = f(x)f(y)$  for all  $x, y \in R$ . If  $\int_0^2 f(x)dx = \alpha$  then  $\int_{-2}^2 f(x)$  is equal to

A.  $2\alpha$

B.  $\alpha$

C. 0

D. none of these



**Answer: C**



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**78.** Let  $f$  be integrable over  $[0, a]$  for any real value of  $a$ .

If 
$$I_1 = \int_0^{\pi/2} \cos \theta f(\sin \theta + \cos^2 \theta) d\theta$$
 and

$$I_2 = \int_0^{\pi/2} \sin 2\theta f(\sin \theta + \cos^2 \theta) d\theta,$$
 then

A.  $I_1 = I_2$

B.  $I_1 = -I_2$

C.  $I_1 = 2I_2$

D.  $I_1 = 2I_2$

**Answer: A**



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**79.** The value of  $\lim_{x \rightarrow 0} \frac{2 \int_0^{\cos x} \cos^{-1}(t) dx}{2x - \sin 2x}$  is

A. 0

B.  $1/2$

C.  $-1/2$

D.  $2/3$

**Answer: C**



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80. If  $I_1 = \int_1^{\sin \theta} \frac{x}{1+x^2} dx$  and  $I_2 = \int_1^{\operatorname{cosec} \theta} \frac{1}{x(x^2+1)} dx$  then the value of

$$\begin{vmatrix} I_1 & I_1^2 & I_2 \\ e^{I_1+I_2} & I_2^2 & -1 \\ 1 & I_1^2 + I_2^2 & -1 \end{vmatrix}, \text{ is}$$

A.  $\sin \theta$

B.  $\operatorname{cosec} \theta$

C. 0

D. 1

**Answer: C**

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81. If  $f(x) = \int_1^x \frac{\log t}{1+t} dt$  then  $f(x) + f\left(\frac{1}{x}\right)$  is equal to

A.  $(\log_e x)^2$

B.  $\frac{2}{3} \log_e x$

C.  $\frac{1}{2} \log_e x$

D.  $\frac{1}{2} (\log_e x)^2$

**Answer: D**

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82. Let  $F(x) = f(x) + f\left(\frac{1}{x}\right)$ , where  $f(x) = \int_1^x \frac{\log t}{1+t} dt$ . Then  $F(e)$  equals

A. 1

B. 2

C.  $1/2$

D. 0

**Answer: C**



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83.  $\int_0^x \frac{bt \cos 4t - a \sin 4t}{t^2} dt = \frac{a \sin 4x}{x}$  for all  $x \neq 0$ , then  $a$  and  $b$  are given by

A.  $a = \frac{1}{4}, b = 1$

B.  $a = 2, b = 2$

C.  $a = -1, b = 4$

D.  $a = 2, b = 4$

**Answer: A**



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84. Let  $f: R \rightarrow R$ ,  $f(x) = \begin{cases} |x - [x]| & [x] \text{ is odd} \\ |x - [x + 1]| & [x] \text{ is even} \end{cases}$  where  $[.]$  denotes greatest integer function, then

A.  $\frac{5}{2}$

B.  $\frac{3}{2}$

C. 5

D. 3

Answer: D



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85. If  $f(x) = \sin x + \cos x$  and  $g(x) = \begin{cases} \frac{|x|}{x} & , x \neq 0 \\ 2 & , x = 0 \end{cases}$  then the value of

$\int_{-\pi/4}^{2\pi} g \circ f(x) dx$  is equal to (a)  $\frac{3\pi}{4}$  (b)  $\frac{\pi}{4}$  (c)  $\pi$  (d) None of these

A.  $3\pi/4$

B.  $\pi/4$

C.  $\pi$

D. none of these

**Answer: B**



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86. If  $x \in \left[ (4n + 1)\frac{\pi}{2}, (4n + 3)\frac{\pi}{2} \right]$  and  $n \in N$ , then the value of

$\int_0^x [\cos t] dt$ , is

A.  $(2n - 1)\frac{\pi}{2} - x$

B.  $(2n - 1)\frac{\pi}{\pi} / (2) - x$

C.  $(2n + 1)\frac{\pi}{2} - x$

D.  $(2n + 1)\frac{\pi}{2} + x$

**Answer: C**



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87. If  $f: R \in R$  is continuous and differentiable function such that

$$\int_{-1}^x f(t)dt + f''(3) \int_x^0 dt = \int_1^x t^3 dt - f'(1) \int_0^x t^2 dt + f'(2) \int_x^3 r dt,$$

then the value of  $f'(4)$ , is

A.  $48 - 8f'(1) + f'(2)$

B.  $48 - 8f'(1) - f''(2)$

C.  $48 + 8f'(1) - f'(2)$

D. none of these

Answer: B



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88. Let  $l_1 = \int_0^1 \frac{e^x}{1+x} dx$  and  $l_2 = \int_0^1 \frac{x^2}{e^{x^3(2-x^3)}} dx$ . Then  $\frac{l_1}{l_2}$  is equal to

A.  $\frac{3}{e}$

B.  $\frac{e}{3}$

C.  $3e$

D.  $\frac{1}{3e}$

**Answer: C**



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89. Let  $f(x) = \begin{cases} 1 - |x|, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$  and  $g(x) = f(x - 1)$  for all  $x \in R$  The value of  $\int_{-3}^3 g(x) dx$  is

A. 2

B. 3

C. 4

D. 5

**Answer: A**





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90. If  $f(x) = \frac{x-1}{x+1}$ ,  $f^2(x) = f(f(x)), \dots, f^{k+1}(x) = f(f^k(x))$

$f^2(x) = f(f(x)), \dots, f^{k+1}(x) = f(f^k(x))$

,  $k=1,2,3,\dots$  and  $g(x) = f^{1998}(x)$  then  $\int_{1/e}^1 g(x)dx$  is equal to

- A. 0
- B. 1
- C. -1
- D. e

Answer: C



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91. If  $f: R \rightarrow R$  be such that

$f(x) = \sqrt{\sin(\cos x)} + \ln(-2 \cos^2 x + 3 \cos x - 1)$ , then

$\int_{x_1}^{x_2} \left[ \cos x - \frac{1}{2} \right] dx$  is equal to, where  $x_1, x_2 \in D$  and  $[\cdot]$  denotes the greatest integer function,

A. 0

B.  $\frac{1}{2}(x_2 - x_1)$

C.  $x_1 - x_2$

D.  $\frac{1}{2}(x_1 - x_2)$

**Answer: A**



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92. If  $\int_e^x t f(t) dt = \sin x - x \cos x - \frac{x^2}{2}$  for all  $x \in R - \{0\}$ , then the value of  $f\left(\frac{\pi}{6}\right)$  will be equal to

A. 0

B. 1

C.  $-\frac{1}{2}$

D. none of these

**Answer: C**

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93. If  $f(x) = \int_0^x \{f(t)\}^{-1} dt$  and  $\int_0^1 \{f(t)\}^{-1} = \sqrt{2}$

A.  $\sqrt{2x}$

B.  $\sqrt{2 \log_e x}$

C.  $\sqrt{3x - 1}$

D. none of these

**Answer: A**

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94. If  $f(x)$  is differentiable and  $\int_0^{t^2} x f(x) dx = \frac{2}{5} t^5$ , then  $f\left(\frac{4}{25}\right)$  equals (a)  $\frac{2}{5}$  (b)  $-\frac{5}{2}$  (c) 1 (d)  $\frac{5}{2}$

A.  $\frac{2}{5}$

B.  $-\frac{5}{2}$

C. 1

D.  $\frac{5}{2}$

**Answer: A**



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95. The value of  $\int_{-2}^2 |1 - x^2| dx$  is \_\_\_\_\_

A.  $\frac{1}{3}$

B.  $\frac{14}{3}$

C.  $\frac{7}{3}$

D. (28)/(3)

**Answer: D**

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96. The integral  $\int_0^{\pi} x f(\sin x) dx$  is equal to

A.  $\pi \int_0^{\pi} f(\cos x) dx$

B.  $\pi \int_0^{\pi} f(\sin x) dx$

C.  $\frac{\pi}{2} \int_0^{\pi/2} f(\sin x) dx$

D.  $\pi \int_0^{\pi/2} f(\cos x) dx$

**Answer: D**

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97. If  $f(x) = \frac{e^x}{1 + e^x}$ ,  $I_1 = \int_{f(-a)}^{f(a)} xg(x(1-x))dx$ , and  $I_2 = \int_{f(-a)}^{f(a)} g(x(1-x))dx$ , then the value of  $\frac{I_2}{I_1}$  is

A. 1

B. -3

C. -1

D. 2

**Answer: D**



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98. The value of  $\int_{-2}^2 |[x]| dx$  is equal to

A. 1

B. 2

C. 3

D. 4

**Answer: D**



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**99.** The value

$$\int^{-2} -(-2) \left\{ p \ln\left(\frac{1+x}{1-x}\right) + q \ln\left(\frac{1-x}{1+x}\right) - 2 + r \right\} dx$$

depends on the value of

A. p

B. q

C. r

D. p and q

**Answer: C**



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100.  $7 \left( \int_0^1 \frac{x^4(1-x)^4 dx}{1+x^2} + \pi \right)$  is equal to

A. 22

B. 23

C. 20

D. 21

**Answer: A**



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101. The value of  $\lim_{x \rightarrow 0} \frac{1}{x^3} \int_0^x \frac{t \ln(1+t)}{t^4 + 4} dt$

A. 0

B.  $1/12$

C.  $1/24$

D.  $1/24$



**Answer: B**



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**102.** Let  $f$  be the function defined on  $[-\pi, \pi]$  given by  $f(0) = 9$  and

$f(x) = \frac{\sin\left(\frac{9x}{2}\right)}{\sin\left(\frac{x}{2}\right)}$  for  $x \neq 0$ . The value of  $\frac{2}{\pi} \int_{-\pi}^{\pi} f(x) dx$  is (asked as

Match the following question)

A. 0

B. 2

C. 4

D. 6

**Answer: C**



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**103.** Let  $f$  be a real valued functional defined on the interval  $(-1, 1)$  such that  $e^{-x} f(x) = 2 + \int_0^x \sqrt{t^4 + 1} dt$ , for all  $x \in (-1, 1)$  and let  $f^{-1}$  be the inverse function of  $f$ . Then  $f^{-1}(2)$  is equal to

- A. 1
- B.  $1/3$
- C.  $1/2$
- D.  $1/e$

**Answer: B**



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**104.** For any real number  $x$ , let  $[x]$  denote the largest integer less than or equal to  $x$ , Let  $f$  be a real-valued function defined on the interval  $[-10, 10]$  be  $f(x) = \{x - [x]$ , if  $[x]$  is odd,  $1 + [x] - x$ , if  $[x]$  is even Then the value of  $\frac{\pi^2}{10} \int_{-10}^{10} f(x) \cos \pi x dx$  is\_\_\_\_\_

A. 3

B. 4

C. 6

D. 9

**Answer: B**



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**105.** about to only mathematics

A.  $f''(x)$  exists for all  $(x \in (0, \infty))$

B.  $f'(x)$  exists for all  $x \in (0, \infty)$  and  $f'(x)$  is continuous on  $(0, \infty)$  but not differentiable on  $(0, \infty)$

C. there exists  $\alpha > 1$  such that  $|f'(x)| < f(x)$  for all  $x \in (\alpha, \infty)$

D. there exists  $\beta > 0$  such that  $|f'(x)| + f'(x) \leq \beta$  for all  $x \in (0, \infty)$

**Answer: C**



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**106.** Let  $p(x)$  be a function defined on  $R$  such that  $p'(x) = p'(1 - x)$  for all  $x \in [0, 1]$ ,  $p(0) = 1$  and  $p(1) = 41$ .

Then  $\int_0^1 p(x) dx$  is equals to (a)42 (b) $\sqrt{41}$  (c)21 (d)41

A. 41

B. 42

C.  $\sqrt{41}$

D. 21

**Answer: D**



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**107.** If  $\int_a^b (f(x) - 3x) dx = a^2 - b^2$  then the value of  $f\left(\frac{\pi}{6}\right)$  is \_\_\_

A.  $\frac{\pi}{6}$

B.  $\frac{2\pi}{3}$

C.  $\frac{\pi}{2}$

D.  $\frac{\pi}{2}$

**Answer: A**



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108. The value of  $\frac{\pi^2}{\ln 3} \int_{\frac{7}{6}}^{\frac{5}{6}} \sec(\pi x) dx$  is \_ \_

A.  $\frac{2\pi}{3}$

B.  $\frac{\pi}{2}$

C.  $\pi$

D.  $\frac{4\pi}{3}$

**Answer: C**



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109. The value of the integral  $\int_{-\pi/2}^{\pi/2} \left( x^2 + \log \frac{\pi - x}{\pi + x} \right) \cos x dx$

A. 0

B.  $\frac{\pi^2}{2} - 4$

C.  $\frac{\pi^2}{2} - 4$

D.  $\frac{\pi^2}{2}$

**Answer: B**



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110. Let  $f: (0, 1) \rightarrow (0, 1)$  be a differentiable function such that

$f'(x) \neq 0$  for all  $x \in (0, 1)$  and  $f\left(\frac{1}{2}\right) = \frac{\sqrt{3}}{2}$ . Suppose for all

$$x \lim_{t \rightarrow x} \left( \frac{\int_0^1 \sqrt{1 - (f(s))^2} ds - \int_0^x \sqrt{1 - (f(s))^2} ds}{f(t) - f(x)} \right) = f(x). \quad \text{Then}$$

the value of  $f\left(\frac{1}{4}\right)$  belongs to:

A.  $\{(\sqrt{7}, \sqrt{15})\}$

B.  $\left\{\frac{\sqrt{7}}{2}, \frac{\sqrt{15}}{2}\right\}$

C.  $\left\{\frac{\sqrt{7}}{3}, \frac{\sqrt{15}}{3}\right\}$

D.  $\left\{\frac{\sqrt{7}}{4}, \frac{\sqrt{15}}{4}\right\}$

**Answer: D**



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111. The value of the integral  $\int_0^2 \frac{\log(x^2 + 2)}{(x + 2)^2} dx$  is

A.  $\frac{\sqrt{2}}{3} \tan^{-1} \sqrt{2} + \frac{5}{12} \log 2 - \frac{1}{4} \log 3$

B.  $\frac{\sqrt{2}}{3} \tan^{-1} \sqrt{2} - \frac{5}{12} \log 2 - \frac{1}{12} \log 3$

C.  $\frac{\sqrt{2}}{3} \tan^{-1} \sqrt{2} + \frac{5}{12} \log 2 + \frac{1}{4} \log 3$

D.  $\frac{\sqrt{2}}{3} \tan^{-1} \sqrt{2} - \frac{5}{12} \log 2 + \frac{1}{12} \log 3$

**Answer: D**





112. The following integral  $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (2 \operatorname{cosec} x)^{17} dx$  is equal to

(a)  $\int_0^{\log(1+\sqrt{2})} 2(e^u + e^{-u})^{16} du$       (b)  $\int_0^{\log(1+\sqrt{2})} 2(e^u + e^{-u})^{17} du$

(c)  $\int_0^{\log(1+\sqrt{2})} 2(e^u - e^{-u})^{17} du$       (d)  $\int_0^{\log(1+\sqrt{2})} 2(e^u - e^{-u})^{16} du$

A.  $\int_0^{\log(1+\sqrt{2})} 2(e^u + e^{-u})^{16} du$

B.  $\int_0^{\log(1+\sqrt{2})} (e^u + e^{-u})^{17} du$

C.  $\int_0^{\log(1+\sqrt{2})} (e^u - e^{-u})^{17} du$

D.  $\int_0^{\log(1+\sqrt{2})} 2(e^u - e^{-u})^{16} du$

**Answer: A**





113. Let  $f: [0, 2] \rightarrow \mathbb{R}$  be a function which is continuous on  $[0, 2]$  and is differentiable on  $(0, 2)$  with  $f(0) = 1$

Let  $F(x) = \int_0^{x^2} f(\sqrt{t}) dt$  for  $x \in [0, 2]$ . If  $F'(x) = f'(x)$  for all  $x \in (0, 2)$ , then  $F(2)$  equals  $e^2 - 1$  (b)  $e^4 - 1$  (c)  $e - 1$  (d)  $e^4$

A.  $e^2 - 1$

B.  $e^4 - 1$

C.  $e - 1$

D.  $e^4$

**Answer: B**



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114. Given that for each  $a \in (0, 1)$ ,  $\lim_{(h \rightarrow 0^+)} \int_h^{1-h} t^{-a}(1-t)^{a-1} dt$  exists. Let this limit be  $g(a)$ . In addition it is given the function  $g(a)$  is differentiable on  $(0, 1)$ .

The value of  $g\left(\frac{1}{2}\right)$  is a.  $\frac{\pi}{2}$  b.  $\pi$  c.  $-\frac{\pi}{2}$  d. 0

A.  $\pi$

B.  $2\pi$

C.  $\frac{\pi}{2}$

D.  $\frac{\pi}{4}$

**Answer: A**



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115. Given that for each  $a \in (0, 1)$ ,  $\lim_{(h \rightarrow 0^+)} \int_h^{1-h} t^{-a}(1-t)^{a-1} dt$  exists. Let this limit be  $g(a)$ . In addition it is given the function  $g(a)$  is differentiable on  $(0, 1)$ .

The value of  $g\left(\frac{1}{2}\right)$  is a.  $\frac{\pi}{2}$  b.  $\pi$  c.  $-\frac{\pi}{2}$  d. 0

A.  $\pi/2$

B.  $\pi$

C.  $-\pi/2$

D. 0

Answer: D



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116. The option(s) with the values of  $a$  and  $L$  that satisfy the following

equation is (are) 
$$\frac{\int_0^L \pi e^{t(s \in^6 at + \cos^4 at)} dt}{\int_0^L \pi e^{t(s \in^6 at + \cos^4 at)} dt} = L$$

$a = 2, L = \frac{e^{4\pi} - 1}{e^\pi - 1}$  (b)  $a = 2, L = \frac{e^{4\pi} + 1}{e^\pi + 1}$   $a = 4, L = \frac{e^{4\pi} - 1}{e^\pi - 1}$  (d)

$a = 4, L = \frac{e^{4\pi} + 1}{e^\pi + 1}$

A.  $a = 2, L = \frac{e^{4\pi} - 1}{e^\pi - 1}$

B.  $a = 2, L = \frac{e^{4\pi} + 1}{e^\pi + 1}$

C.  $a = 4, L = \frac{e^{4\pi} - 1}{e^\pi - 1}$

D.  $a = 4, L = \frac{e^{4\pi} + 1}{e^\pi + 1}$

Answer: A::C



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117. Let  $f: R \rightarrow R$  be a continuous odd function, which vanishes exactly at one point and  $f(1) = \frac{1}{2}$ . Suppose that  $F(x) = \int_{-1}^x f(t)dt$  for all  $x \in [-1, 2]$  and  $G(x) = \int_{-1}^x t|f(f(t))|dt$  for all  $x \in [-1, 2]$ . If  $\lim_{x \rightarrow 1} \frac{F(x)}{G(x)} = \frac{1}{14}$ , Then the value of  $f\left(\frac{1}{2}\right)$  is

A. 7

B. 8

C. 9

D. 6

**Answer: A**



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118. Let  $F: R \rightarrow R$  be a thrice differentiable function. Suppose that  $F(1) = 0$ ,  $F(3) = -4$  and  $F(x) < 0$  for all  $x \in (1, 3)$ .  $f(x) = xF(x)$  for all  $x \in R$ .

If  $\int_1^3 x^2 F'(x) dx = -12$  and  $\int_1^3 x^3 F''(x) dx = 40$ , then the correct expression (s) is //are

A.  $9f'(3) + f'(1) - 32 = 0$

B.  $\int_1^3 f(x) dx = 12$

C.  $9f'(3) - f'(1) + 32 = 0$

D.  $\int_1^3 f(x) dx = -12$

**Answer: C::D**

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**119.** Let  $f: (0, \infty) \rightarrow \mathbb{R}$  be a continuous function such that

$f(x) = \int_0^x tf(t)dt$ . If  $f(x^2) = x^4 + x^5$ , then  $\sum_{r=1}^{12} f(r^2)$ , is equal to

A. 216

B. 219

C. 222

D. 225

**Answer: B**



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**120.** Let  $f: [0, 1] \rightarrow \mathbb{R}$  be a differentiable functions with non-increasing derivative such that  $f(0) = 0$ ,  $f'(1) > 0$ , then

A.  $\int_0^1 \frac{1}{f^2(x) + 1} dx > \frac{f(1)}{f'(1)}$

B.  $\int_0^1 \frac{1}{f^2(x) + 1} dx < \frac{f(1)}{f'(1)}$

C.  $\int_0^1 \frac{1}{f^2(x) + 1} dx < \frac{\tan^{-1}(f(1))}{f'(1)}$

D.  $\int_0^1 \frac{1}{f^2(x) + 1} dx = \frac{f(1)}{f'(1)}$

**Answer: C**



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121. Let  $f: R \rightarrow R$  be a differentiable function such that

$$f(x) = x^2 + \int_0^x e^{-t} f(x-t) dt. f(x) \text{ increases for}$$

A.  $\frac{-2}{3}$

B.  $\frac{2}{3}$

C.  $\frac{1}{3}$

D.  $-\frac{1}{3}$

**Answer: B**



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122. If  $f(x)$  is a continuous function such that  $f(x) > 0$  for all  $x > 0$  and

$$(f(x))^{2020} = 1 + \int_0^x f(t) dt, \text{ then the value of } \{f(2020)\}^{2019} \text{ is equal to}$$

A. 2019

B. 2020

C. 2021

D. 2018

**Answer: B**



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**123.** If a function  $y=f(x)$  such that  $f'(x)$  is continuous function and satisfies

$$(f(x))^2 = k + \int_0^x [\{f(t)\}^2 + \{f'(t)\}^2] dt, k \in R^+, \text{ then}$$

A.  $f(x)$  is an increasing function for all  $x \in R$

B.  $f(x)$  is a bounded function

C.  $f(x)$  is neither even nor odd function

D. If  $k=100$ , then  $f(0)=10$ .

**Answer: A::C**



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124. The maximum value of  $f(x) = \int_0^1 t \sin(x + \pi t) dt$  is

A.  $\frac{1}{\pi} \sqrt{\pi^2 + 4}$

B.  $\frac{1}{\pi^2} \sqrt{\pi^2 + 4}$

C.  $\sqrt{\pi^2 + 4}$

D.  $\frac{1}{2\pi^2} \sqrt{\pi^2 + 4}$

Answer: B



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125. If  $I_n = \int_0^\pi e^x \sin^n x \, dx$  then  $\frac{I_3}{I_1}$  is equal to

A.  $\frac{3}{5}$

B.  $\frac{1}{5}$

C. 1

D.  $\frac{2}{5}$

**Answer: A**



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126. If  $\lambda = \int_0^1 \frac{e^t}{1+t}$ , then find the value of  $\int_0^1 e^t \log_e(1+t) dt$

A. k

B. 2k

C. e ln 2-k

D. none of these

**Answer: C**



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127. If  $k \in N$  and  $I_k = \int_{-2k\pi}^{2k\pi} |\sin x| [\sin x] dx$ , where  $[\cdot]$  denotes the greatest integer function, then  $\int_{k=1}^{100} I_k$  equal to

A. -10100

B. -40400

C. -20200

D. none of these

**Answer: C**

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**128.** The value of

$$\int_{-1}^1 \frac{\log(x + \sqrt{1+x^2})}{x + \log(x + \sqrt{1+x^2})} f(x) dx - \int_{-1}^1 \frac{\log(x + \sqrt{1+x^2})}{x + \log(x + \sqrt{1+x^2})} f(-x) dx$$

,

A. 0

B.  $2 \int_0^1 \frac{\log(x + \sqrt{1+x^2})}{x + \log(x + \sqrt{1+x^2})} \{f(x) - f(-x)\} dx$

C.  $2f(x)$

D. none of these

**Answer: A**

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129. If  $\int_0^1 \alpha e^{\beta x^2} \sin(x+k) dx = 0$  for some  $\alpha, \beta \in R, \alpha \neq 0$ , then the value of  $k$  can belong to the interval

A.  $\left[ \frac{\pi}{3}, \frac{5\pi}{12} \right]$

B.  $\left[ \frac{\pi}{3}, \frac{\pi}{2} \right]$

C.  $\left[ \frac{3\pi}{4}, \frac{5\pi}{6} \right]$

D.  $\left[ -\frac{\pi}{2}, -\frac{\pi}{3} \right]$

**Answer: C**

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130.  $\int_0^{[x]/3} \frac{8^x}{2^{[3x]}} dx$  where  $[.]$  denotes the greatest integer function, is equal to

A.  $\frac{[x]}{\ln 2}$

B.  $\frac{[x]}{\ln 2}$

C.  $\frac{2[x]}{\ln 2}$

D.  $\frac{[x]}{\ln 8}$

**Answer: D**



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131. Let  $f(x) = \ln \left[ \cos|x| + \frac{1}{2} \right]$  where  $[.]$  denotes the greatest integer function, then  $\int_{x_1}^{x_2} \lim_{n \rightarrow \infty} \left( \frac{\{f(x)\}^n}{x^2 + \tan^2 x} \right) dx$  is equal to, where  $x_1, x_2 \in \left[ \frac{-\pi}{6}, \frac{\pi}{6} \right]$

A. 1

B. 2

C. -1

D. 0

**Answer: D**



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132.  $\lim_{x \rightarrow 0} \left( \frac{\int_0^x x e^{t^2} dt}{1 + x - e^x} \right)$  is equal to

A. 1

B. -1

C. 2

D. -2

**Answer: D**



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133. If  $\int_{2x^2}^{x^3} (\ln x) f(t) dt = x^2 - 2x + 5$ , then  $f(8) =$

A.  $\frac{1}{\ln 2}$

B.  $\frac{1}{2\ln 2}$

C.  $\frac{1}{3\ln 2}$

D.  $\frac{1}{4\ln 2}$

Answer: B



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134.  $\lim_{x \rightarrow 0} \frac{\int_{-x}^x f(t) dt}{\int_0^{2x} f(t+4) dt}$  is equal to

A.  $f(0)$

B. 0

C.  $\frac{f(4)}{f(0)}$

D.  $\frac{f(0)}{f(4)}$

**Answer: D**



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**135.** IF  $f(x + f(y)) = f(x) + y \forall x, y \in R$  and  $f(0) = 1$ , then

$\int_0^{10} f(10 - x) dx$  is equal to

A. 1

B. 10

C.  $\int_0^1 f(x) dx$

D.  $10 \int_0^1 f(x) dx$

**Answer: D**



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136. If  $\alpha, \beta (\beta > \alpha)$ , are the roots of  $g(x) - ax^2 + bx + c = 0$  and  $f(x)$  is an even function, then  $\int_{\alpha}^{\beta} \frac{e}{e^{f\left(\frac{g(x)}{x-\alpha}\right)} + e^{f\left(\frac{g(x)}{x-\beta}\right)}} = \left| \frac{b}{2a} \right|$  (b)

$\frac{\sqrt{b^2 - 4ac}}{|2a|} \left| \frac{b}{a} \right|$  (d) none of these

A.  $\left| \frac{b}{a} \right|$

B.  $\left| \frac{b}{2a} \right|$

C.  $\frac{\sqrt{b^2 - 4ac}}{|2a|}$

D. none of these

Answer: C

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137. The value of the constant  $a > 0$  such that  $\int_0^a [\tan^{-1} \sqrt{x}] dx = \int_0^a [\cot^{-1} \sqrt{x}] dx$ , where  $[.]$  denotes the greatest integer function, is

A.  $\frac{2(3 + \cos 4)}{1 - \cos 4}$

B.  $\frac{2(3 - \cos 4)}{1 + \cos 4}$

C.  $\frac{2(3 - \cos 4)}{1 - \cos 4}$

D.  $\frac{2(3 + \cos 4)}{1 + \cos 4}$

**Answer: A**



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**138.** If  $f(x)$  is a continuous function in  $[0, \pi]$  such that  $f(0)=f(\pi)=0$ , then the value of

$$\int_0^{\pi/2} \{f(2x) - f''(2x)\} \sin x \cos x dx \text{ is equal to}$$

A.  $\pi$

B.  $2\pi$

C.  $3\pi$

D. 0

**Answer: D**

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139. Let  $f: R \rightarrow R$  be a continuous function and  $f(x) = f(2x)$  is true

$\forall x \in R$ . If  $f(1) = 3$ , then the value of  $\int_{-1}^1 f(f(x)) dx$  is equal to

A.  $3f(0)$

B. 0

C.  $3f(3)$

D. 6

Answer: D

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140. The value of

$$\int_0^{\pi/4} (\tan^n x + \tan^{n-2} x) d\left(x - \frac{[x]}{1!} + \frac{[x]^2}{2!} - \frac{[x]^3}{3!} + \dots\right)$$

where  $[x]$  is greatest function, is

A.  $\frac{1}{n}$

B.  $\frac{1}{n+2}$

C.  $\frac{1}{n-1}$

D.  $\frac{1}{n-2}$

**Answer: C**



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**141.** The value of the definite integral

$$\int_{t+2\pi}^{t+5\pi/2} \{ \sin^{-1}(\cos x) + \cos^{-1}(\cos x) \} dx \text{ is equal to}$$

A.  $\frac{\pi^2}{2}$

B.  $\frac{\pi^2}{8}$

C.  $\frac{\pi^2}{4}$

D. none of these

**Answer: C**



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142. If  $f(x)$  is an integrable function on  $\left[\frac{\pi}{6}, \frac{\pi}{3}\right]$  and

$$I_1 = \int_{\pi/6}^{\pi/3} \sec^2 \theta f(2 \sin 2\theta) d\theta \quad \text{and} \quad I_2 = \int_{\pi/6}^{\pi/3} \operatorname{cosec}^2 \theta f(2 \sin 2\theta) d\theta,$$

then

A.  $I_1 = 2I_2$

B.  $I_1 = 3I_2$

C.  $2I_1 = I_2$

D. none of these

Answer: D



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143. Let

$$f(x) = \lim_{n \rightarrow \infty} \left\{ \frac{n^n (x+n) \left(x + \frac{n}{2}\right) \dots \left(x + \frac{n}{2}\right)}{n! (x^2 + n^2) \left(x^2 + \frac{n^2}{4}\right) \dots \left(x^2 + \frac{n^2}{n^2}\right)} \right\}^{x/n} \quad \text{for all } x > 0$$

. Then,

A.  $f\left(\frac{1}{2}\right) \geq f(1)$

B.  $f\left(\frac{1}{3}\right) \leq f\left(\frac{2}{3}\right)$

C.  $f'(2) \leq 0$

D.  $\frac{f'(3)}{f(3)} \geq \frac{f'(2)}{f(2)}$

**Answer: B::C**



**View Text Solution**

**144.** The total number for distinct  $x \in [0, 1]$  for which

$$\int_0^x \frac{t^2}{1+t^4} dt = 2x - 1 \text{ is } \underline{\hspace{2cm}}.$$

A. 1

B. 2

C. 3

D. infinitely many

**Answer: A**



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**145.** For  $x \in R, x \neq 0$ , if  $y(x)$  differential function such that  $x \int_1^x y(t) dt = (x + 1) \int_1^x ty(t) dt$ , then  $y(x)$  equals: (where  $C$  is a constant.)

A.  $Cx^3e^{1/x}$

B.  $\frac{C}{x^2}e^{-1/x}$

C.  $\frac{C}{x^2}e^{-1/x}$

D.  $\frac{C}{x^3}e^{-1/x}$

**Answer: D**



**Watch Video Solution**

1. Statement-1:  $\int_0^{\pi/2} x \cot x dx = \frac{\pi}{2} \log 2$

Statement-2:  $\int_0^{\pi/2} \log \sin x dx = -\frac{\pi}{2} \log 2$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

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2. Statement-1:  $\int_0^{n\pi+v} |\sin x| dx = 2n + 1 - \cos v$  where  $n \in \mathbb{N}$  and

$0 \leq v < \pi$ .

Statement-2: If  $f(x)$  is a periodic function with period  $T$ , then



$$(i) \int_0^{nT} f(x)dx = n \int_0^T f(x)dx, \text{ where } n \in \mathbb{N}$$

$$\text{and (ii) } \int_{nT}^{nT+a} f(x)dx = \int_0^a f(x)dx, \text{ where } n \in \mathbb{N}$$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

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3. Let  $I_n = \int_0^{\pi/4} \tan^n x dx$ .

Statement-1:  $\frac{1}{n+1} < 2I_n < \frac{1}{n-1}$  for all  $n=2,3,4,\dots$

Statement-2:  $I_n + I_{n-2} = \frac{1}{n-1}, n=3,4,5,\dots$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**

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4. Statement-1: If  $f(x) = \int_1^x \frac{\log_e t}{1+t+t^2} dt$ , then

$f(x) = f\left(\frac{1}{x}\right)$  for all  $x > 0$ .

Statement-2: If  $f(x) = \int_1^x \frac{\log_e t}{1+t} dt$ , then  $f(x) + f\left(\frac{1}{x}\right) = \frac{(\log_e x)^2}{2}$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for

Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**

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5. Let  $n \in \mathbb{N}$  such that  $n > 1$ .

Statement-1: 
$$\int_{-\infty}^0 \frac{1}{1+x^n} dx = \int_0^1 \frac{1}{(1-x^n)^{1/n}} dx$$

Statement-2: 
$$\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**



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**6. Statement-1:** For any  $n \in \mathbb{N}$ , we have

$$\int_0^{n\pi} \left| \frac{\sin x}{x} \right| dx \geq \frac{2}{\pi} \left( 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} \right)$$

**Statement-2:**  $\frac{\sin x}{x} \geq \frac{2}{\pi}$  on  $\left(0, \frac{\pi}{2}\right)$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: B**



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7. Statement-1:  $\int_0^1 \frac{\cos x}{1+x^2} dx > \frac{\pi}{4} \cos 1$

Statement-2: If  $f(x)$  and  $g(x)$  are continuous on  $[a,b]$ , then

$$\int_a^b f(x)g(x)dx = f(c) \int_a^b g(x) \text{ for some } c \in (a, b).$$

- A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.
- B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.
- C. Statement-1 is True, Statement-2 is False.
- D. Statement-1 is False, Statement-2 is True.

**Answer: A**



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**8. Statement-1:**

$$\int_0^{\sin^2 x} \sin^{-1} \sqrt{t} dt + \int_0^{\cos^2 x} \cos^{-1} \sqrt{t} dt = \frac{\pi}{4} \text{ for all } x.$$

Statement-2:  $\frac{d}{dx} \int_{\theta(x)}^{\psi(x)} f(t) dt = \psi'(x)f(\psi(x)) - \theta'(x)f(\theta(x))$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



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**9. Statement-1:**  $\int_0^{\pi/2} \frac{1}{1 + \tan^3 x} dx = \frac{\pi}{4}$

Statement-2:  $\int_0^a f(x) dx = \int_0^a f(a+x) dx$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: C**

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10. Let  $F(x) = \int_a^{x^2} \cos \sqrt{t} dt$

Statement-1:  $F'(x) = \cos x$

Statement-2: If  $f(x) = \int_a^x \phi(t) dt$ , then  $f'(x) = \phi(x)$ .

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for

Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

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11.  $I_n = \int_0^{\pi/4} \tan^n x dx$ , where  $n \in \mathbb{N}$

Statement-1:  $\int_0^{\pi/4} \tan^4 x dx = \frac{3\pi - 8}{12}$

Statement-2:  $I_n + I_{n-2} = \frac{1}{n-1}$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.



C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: A**



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**12. Statement-1:** The value of the integral

$$\int_{\pi/6}^{\pi/3} \frac{1}{1 + \sqrt{\tan x}} dx \text{ is equal to } \frac{\pi}{6}$$

$$\text{Statement-2: } \int_a^b f(x) dx = \int_a^b f(a + b - x) dx$$

A. Statement-1 is true, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

**Answer: D**

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## Exercise

1. If  $I = \int_{-2}^2 dx$ , then I equals

A. 6

B. 8

C. 4

D. 21

**Answer: C**

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2. The value of the integral  $\int_{\alpha}^{\beta} \frac{1}{\sqrt{(x-\alpha)(\beta-x)}} dx$  for  $\beta > \alpha$ , is

A.  $\sin^{-1}(\alpha/\beta)$

B.  $\pi/2$

C.  $\sin^{-1}(\beta/2\alpha)$

D.  $\pi$

**Answer: D**

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3.  $\int_1^{\frac{4\sqrt{3}}{3}-1} \frac{x+2}{\sqrt{x^2+2x-3}} dx$  equal to

A.  $\frac{2}{\sqrt{3}} - \frac{1}{2}\log 3$

B.  $\frac{2}{\sqrt{3}} + \log(2\sqrt{3}-1)$

C.  $\frac{2\sqrt{3}}{3} - \frac{1}{2}\log(\sqrt{3}+2)$

D.  $\frac{2\sqrt{3}}{3} + \frac{1}{2}\log(\sqrt{3}+2)$

**Answer: B**



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4.  $\int_0^{\pi^2/4} \sin \sqrt{x} dx$  equals to

A. 0

B. 1

C. 2

D. 4

**Answer: C**



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5.  $\int_{1/2}^2 |\log_{10} x| dx$  equals to

A.  $\log_{10}(8/e)$

B.  $\frac{1}{2} \log_{10}(8/e)$

C.  $\log_{10}(2/e)$

D. none of these

**Answer: B**



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6. Evaluate:  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \log\left(\frac{a - \sin \theta}{a + \sin \theta}\right) d\theta, a > 0$

A. 0

B. 1

C. 2

D. none of these

**Answer: A**



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7. The value of the integral  $\int_{-\pi/3}^{\pi/3} \frac{x \sin x}{\cos^2 x} dx$ , is

- A.  $(\pi/3 - \log \tan 3\pi/2)$
- B.  $2(2\pi/3 - \log \tan 5\pi/12)$
- C.  $3(\pi/2 - \log \sin \pi/12)$
- D. none of these

**Answer: B**

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8. The value of  $\int_1^{7\sqrt{2}} \frac{1}{x(2x^7 + 1)} dx$  is

- A.  $\log(6/5)$
- B.  $6 \log(6/5)$
- C.  $(1/7) \log(6/5)$
- D.  $(1/12) \log(6/5)$

**Answer: C**



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9. The value of  $\int_{-1}^3 \{|x - 2| + [x]\} dx$ , where  $[.]$  denotes the greatest integer function, is equal to

A. 7

B. 5

C. 4

D. 3

**Answer: A**



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10. If  $f(x) = \begin{vmatrix} \sin x + \sin 2x + \sin 3x & \sin 2x & \sin 3x \\ 3 + 4 \sin x & 3 & 4 \sin x \\ 1 + \sin x & \sin x & 1 \end{vmatrix}$  then the value of

$\int_0^{\pi/2} f(x) dx$ , is

A. 3

B.  $2/3$

C.  $1/3$

D. 0

**Answer: C**



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11. Evaluate  $\lim_{x \rightarrow \infty} \frac{\left(\int_0^x e^{x^2} dx\right)^2}{\int_0^x e^{2x^2} dx}$ .

A. 1

B. 2



C. 3

D. 0

**Answer: D**

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12. The value of  $\int_1^4 e^{\sqrt{x}} dx$ , is

A.  $e^2$

B.  $2e^2$

C.  $4e^2$

D.  $3e^2$

**Answer: B**

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13. The value of  $\int_0^{1000} e^{x - [x]} dx$ , is ( $[.]$  denotes the greatest integer function) :

A.  $\frac{e^{1000} - 1}{1000}$

B.  $\frac{e^{1000} - 1}{e - 1}$

C.  $1000(e-1)$

D.  $\frac{e - 1}{1000}$

**Answer: C**



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14. The value of the integral  $\int_0^{100} \sin(x - [x])\pi dx$ , is

A.  $100/\pi$

B.  $200/\pi$

C.  $100\pi$

D.  $200\pi$

**Answer: B**



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15. The difference between the greatest and least values of the function

$$\phi(x) = \int_0^x (t + 1)dt \text{ on } [2,3], \text{ is}$$

A. 3

B. 2

C.  $7/2$

D.  $11/2$

**Answer: C**



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16. The value of  $\int_0^1 \frac{2^{2x+1} - 5^{2x-1}}{10^x} dx$  is

A.  $\frac{3}{5} \left\{ \frac{2}{\log e \left( \frac{2}{5} \right)} + \frac{1}{2 \log e \left( \frac{5}{2} \right)} \right\}$

B.  $-\frac{3}{5} \left\{ \frac{2}{\log e \left( \frac{2}{5} \right)} + \frac{1}{2 \log e \left( \frac{5}{2} \right)} \right\}$

C.  $\frac{3}{5} \left\{ \frac{2}{\log e \left( \frac{2}{5} \right)} - \frac{1}{2 \log e \left( \frac{5}{2} \right)} \right\}$

D. none of these

**Answer: B**



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17. The value of  $\int_0^{\pi/2} \frac{\cos 3x + 1}{2 \cos x - 1} dx$  is

A. 2

B. 1

C. 1/2

D. 0

**Answer: B**

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18. The value of  $\int_0^{16\pi/3} |\sin x| dx$  is

A. 21

B.  $21/2$

C. 10

D. 11

**Answer: B**

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19. If  $\int_0^{n\pi} f(\cos^2 x) dx = k \int_0^{\pi} f(\cos^2 x) dx$ , then the value of  $k$ , is

A. 1

B.  $n$

C.  $n/2$

D. none of these

**Answer: B**



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20. The value of  $\int_{-\pi}^{\pi} \sin x f(\cos x) dx$  is

A.  $\pi$

B.  $2\pi$

C.  $2f(1)$

D. none of these

**Answer: D**



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21. If  $a < \int_0^{2\pi} \frac{1}{10 + 3 \cos x} dx < b$ . Then the ordered pair (a,b) is

A.  $\left(\frac{2\pi}{7}, \frac{2\pi}{3}\right)$

B.  $\left(\frac{2\pi}{13}, \frac{2\pi}{7}\right)$

C.  $\left(\frac{\pi}{10}, \frac{2\pi}{13}\right)$

D. none of these

**Answer: B**



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22. The value of the integral  $\int_0^{\infty} \frac{x \log x}{(1+x^2)^2} dx$ , is (a) 0 (b)  $\log 7$  (c)  $5 \log$

13 (d) none of these

A. 1

B. 0

C. 2

D. none of these

**Answer: B**



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23. The value of the integral  $\int_{-\pi/2}^{\pi/2} \sqrt{\cos x - \cos^2 x} dx$  is

A. 0

B.  $2/3$

C.  $4/3$

D. none of these

**Answer: C**



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24. The value of the integral  $\int_{-\pi/2}^{\pi/2} \sqrt{\frac{1 + \cos 2x}{2}} dx$  is

A. -2

B. 2

C. 0

D. -3

**Answer: B**



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25. Let  $I_1 = \int_1^2 \frac{x}{\sqrt{1+x^2}} dx$  and  $I_2 = \int_1^2 \frac{1}{x} dx$ . Then

A.  $I_1 > I_2$

B.  $I_2 > I_1$

C.  $I_1 = I_2$

D.  $I_2 > 2I_1$

**Answer: A**



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26. Evaluate the following integral:  $\int_0^{\pi/4} \frac{s \in x + \cos x}{3 + s \in 2x} dx$

A.  $-\frac{1}{4} \log 3$

B.  $\frac{1}{4} \log 3$

C.  $-\frac{1}{3} \log 4$

D. none of these

**Answer: B**



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27. The value of the integral  $\int_0^{\pi/4} \frac{\sin \theta + \cos \theta}{9 + 16 \sin 2\theta} d\theta$ , is

A.  $\log 3$

B.  $\log 2$

C.  $\frac{1}{20} \log 3$

D.  $\frac{1}{20} \log 2$

**Answer: C**



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28. Let  $\frac{d}{dx} F(x) = \left( \frac{e^{\sin x}}{x} \right), x > 0.$  If

$\int_1^4 \frac{3}{x} e^{\sin x} dx = F(k) - F(1),$  then one of the possible values of  $k,$

is: 15 (b) 16 (c) 63 (d) 64

A. 64

B. 15

C. 16

D. 63

**Answer: A**



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29. If  $I = \int_{-1}^1 \left( [x^2] + \log\left(\frac{2+x}{2-x}\right) \right) dx$  where  $[x]$  denotes the greatest integer  $\leq x$ , then  $I$  equals :

A. -2

B. -1

C. 0

D. 1

Answer: C



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30. The value of  $\int_{-\pi/2}^{\pi/2} (x^2 + x \cos x + \tan^5 x + 1) dx$  is equal to

A. 0

B. 2

C.  $\pi$

D. none of these

**Answer: D**



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31. Evaluate:  $\int_{-1}^4 f(x)dx = 4$  and  $\int_2^4 (3 - f(x))dx = 7$ , then find the value of  $\int_{-1}^2 f(x)dx$ .

A. 2

B. -3

C. -5

D. none of these

**Answer: C**



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32. The value of  $I = \int_0^{\pi/2} \frac{1}{1 + \cos x} dx$  is

A.  $\frac{\pi}{4}$

B.  $\frac{\pi}{2}$

C. 1

D.  $\pi$

**Answer: C**



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33. about to only mathematics

A.  $\frac{\pi}{2}$

B.  $\sqrt{2} \log(\sqrt{2} + 1)$

C.  $\frac{1}{\sqrt{2}} \log(\sqrt{2} + 1)$

D. none of these

**Answer: C**



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34. The value of integral  $\int_a^b \frac{|x|}{x} dx, a < b$  is :

A.  $|a|-|b|$

B.  $|b|-|a|$

C.  $|a|-|b|$

D.  $|b|-|a|$

**Answer: B**



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35. The value of the integral

$$\int_0^{2\pi} \frac{\sin 2\theta}{a - b \cos \theta} d\theta \text{ when } a > b > 0, \text{ is}$$

A. 1

B.  $\pi$

C.  $\pi/2$

D. 0

**Answer: D**

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36. The value of the integral  $I = \int_0^1 x(1-x)^n dx$  is equal to

A.  $\frac{1}{n+1} + \frac{1}{n+2}$

B.  $\frac{1}{(n+1)(n+2)}$

C.  $\frac{1}{n+2} - \frac{1}{n+1}$

D.  $2\left(\frac{1}{n+1} - \frac{1}{n+2}\right)$

**Answer: B**

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37. The value of the integral

$$\int_0^{3\alpha} \operatorname{cosec}(x - \alpha) \operatorname{cosec}(x - 2\alpha) dx \text{ is}$$

A.  $2\operatorname{sec}\alpha \log\left(\frac{1}{2}\operatorname{cosec}\alpha\right)$

B.  $2\operatorname{sec}\alpha \log\left(\frac{1}{2}\sec \alpha\right)$

C.  $2\operatorname{cosec}\alpha \log(\sec\alpha)$

D.  $2 \operatorname{cosec} \alpha \log\left(\frac{1}{2}\sec \alpha\right)$

Answer: D



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38. The value of the integral  $\int_0^{\pi} \frac{\sin 2kx}{\sin x} dx$ , where  $k \in I$ , is :

A.  $\pi$

B.  $\frac{\pi}{2}$

C.  $\frac{k\pi}{2}$

D. 0

**Answer: D**



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39. The value of the integral  $\int_0^1 \frac{dx}{x^2 + 2x \cos \alpha + 1}$  is equal to  $\sin \alpha$  (b)

$\alpha \sin \alpha$   $\frac{\alpha}{2 \sin \alpha}$  (d)  $\frac{\alpha}{2} \sin \alpha$

A.  $\sin \alpha$

B.  $\alpha \sin \alpha$

C.  $\frac{\alpha}{2 \sin \alpha}$

D.  $\frac{\alpha}{2} \sin \alpha$

**Answer: C**



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40. The greater value of  $F(x) = \int_1^x |t| dt$  on the interval  $[-1/2, 1/2]$ , is

A.  $\frac{3}{8}$

B.  $\frac{1}{2}$

C.  $-\frac{3}{8}$

D.  $-\frac{1}{2}$

**Answer: C**



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41. The value of the integral  $\int_0^{\pi/2} |\sin x - \cos x| dx$ , is

A. 0

B.  $2(\sqrt{2} - 1)$

C.  $2\sqrt{2}$

D.  $2(\sqrt{2} + 1)$

**Answer: A**



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**42.** The value of the integral  $\int_{-\pi/4}^{\pi/4} \sin^{-4} x dx$ , is

A.  $-\frac{8}{3}$

B.  $\frac{3}{2}$

C.  $\frac{8}{3}$

D. none of these

**Answer: A**



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**43.** The value of the integral  $I = \int_1^{\infty} \frac{x^2 - 2}{x^3 \sqrt{x^2 - 1}} dx$ , is

A. 0

B.  $\frac{2}{3}$

C.  $\frac{4}{3}$

D. none of these

**Answer: A**



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44.  $\int_0^1 |\sin 2\pi x| dx$  is equal to

A. 0

B.  $-\frac{1}{\pi}$

C.  $\frac{1}{\pi}$

D.  $\frac{2}{\pi}$

**Answer: D**



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45. Evaluate:  $\int_{-\pi}^{\pi} (\cos ax + s \in bx)^2 dx$

A.  $-\pi$

B. 0

C.  $\pi$

D.  $2\pi$

**Answer: D**



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46. The value of the definite integral  $\int_0^1 (1 + e^{-x} \wedge 2) dx$  (b)  $2 1 + e^{-1}$

(d) none of these

A. -1

B. 2

C.  $1 + e^{-1}$

D. none of these

**Answer: D**

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47. If  $I = \int_{-\pi}^{\pi} \frac{\sin^2}{1 + a^x} dx$ ,  $a > 0$ , then I equals

A.  $\pi$

B.  $\frac{\pi}{2}$

C.  $a\pi$

D.  $a\frac{\pi}{2}$

**Answer: B**

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48. If  $n$  is an odd natural number, then

$$\int_{-\pi/6}^{\pi/6} \frac{\pi + 4x^n}{-\sin\left(x + \frac{\pi}{6}\right)} dx =$$

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49. If  $I_1 = \int_0^x e^{zx} e^{-z^2} dz$  and  $I_2 = \int_0^x e^{-z^2/4} dz$ , then

A.  $I_1 = e^x I_2$

B.  $I_1 = e^{x^2} I_2$

C.  $I_1 = e^{x^2/2} I_2$

D. none of these

**Answer: D**

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50.  $\int_0^{1/2} |\sin \pi x| dx$  is equal to



A. 0

B.  $\pi$

C.  $-\pi$

D.  $1/\pi$

**Answer: D**



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51. If  $f(x) = \int_0^x \log\left(\frac{1-t}{1+t}\right) dt$ , then discuss whether even or odd?

A. an even function

B. an odd function

C. a periodic function

D. none of these

**Answer: A**



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52.  $\int_{1/3}^3 \frac{1}{x} \sin\left(\frac{1}{x} - x\right) dx$  is equal to

A.  $\frac{\sqrt{3}}{2}$

B.  $\frac{\sqrt{3}\pi}{2}$

C. 0

D. none of these

**Answer: C**



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53. If  $F(x) = \int_{x^2}^{x^3} \log t dt$  ( $x > 0$ ), then  $F'(x)$  equals

A.  $(9x^2 - 4x) \log x$

B.  $(4x - 9x^2) \log x$

C.  $(9x^2 + 4x) \log x$

D. none of these

**Answer: A**

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54. If  $I = \int_0^1 \frac{dx}{\sqrt{1+x^4}}$  then

A.  $I > 2$

B.  $I \neq \frac{\sqrt{5}}{2}$

C.  $I > \frac{\sqrt{7}}{2}$

D. none of these

**Answer: B**

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55. If  $I = \int_0^1 \frac{dx}{1+x^4}$ , then

A.  $I > 0.78$

B.  $I < 0.78$

C.  $I > 1$

D. none of these

**Answer: D**

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56. The value of  $\int_{-1}^1 (x|x|)dx$  is equal to

A. 2

B. 1

C. 0

D. none of these

**Answer: C**

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57. If  $\int_0^{\pi/2} \cos^n x \sin^n x dx = \lambda \int_0^{\pi/2} \sin^n x dx$ , then  $\lambda =$

A.  $\frac{1}{2^{n-1}}$

B.  $\frac{1}{2^{n+1}}$

C.  $\frac{1}{2^n}$

D.  $\frac{1}{2}$

**Answer: C**

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58. The value of  $\int_{1/e}^e \frac{|\log x|}{x^2} dx$ , is

A. 2

B.  $\frac{2}{e}$

C.  $2\left(1 - \frac{1}{e}\right)$

D. 0

**Answer: C**

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59.  $\int_{ac}^{bc} f(x) dx$ , where  $c \neq 0$ , is also equal to :

A.  $\frac{1}{c} \int_a^b f(x) dx$

B.  $\int_a^b f(x) dx$

C.  $c \int_a^b f(x) dx$

D.  $c \int_{ac^2}^{bc^2} f(x) dx$

**Answer: B**

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60.  $\frac{d}{dx} \left( \int_{f(x)}^{g(x)} \phi(t) dt \right)$  is equal to

A.  $\phi(g(x)) - \phi(f(x))$

B.  $\frac{1}{2}[\phi(g(x))]^2 - \frac{1}{2}[\phi(f(x))]^2$

C.  $g'(x)\phi(g(x)) - f'(x)\phi(f(x))$

D.  $\phi(g(x))g'(x) - \phi(f(x))f'(x)$

**Answer: C**

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61. If  $f(x) = ae^{2x} + be^x + cx$ , satisfies the conditions  $f(0)=-1$ ,  $f'(\log 2)=31$ ,

$\int_0^{\log 4} (f(x) - cx) dx = \frac{39}{2}$ , then

A.  $a = 5, b = -6, c = 3$

B.  $a = 5, b = 6, c = 7$

C.  $a = -5, b = 6, c = 0$

D. none of these

**Answer: A**

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62. The value of  $\int_0^2 \left| \cos \frac{\pi}{2}t \right| dt$  is equal to

A.  $2\pi$

B.  $\pi/2$

C.  $3/4\pi$

D.  $4/\pi$

**Answer: D**

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63. If  $\int_0^1 \cot^{-1}(1 - x + x^2) dx = k \int_0^1 \tan^{-1} x dx$ , then  $k =$



A. 1

B. 2

C.  $\pi$

D.  $2\pi$

**Answer: B**



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64. If  $0 < a < 1$ , then  $\int_{-1}^1 \frac{1}{\sqrt{1 - 2ax + a^2}} dx$  is equal to

A. 1

B.  $2\pi$

C.  $\pi/2$

D.  $\frac{\log\left(\frac{a+1}{a-1}\right)}{a}$

**Answer: D**



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65. The value of  $\int_0^{\pi/2} \frac{x + \sin x}{1 + \cos x} dx$ , is

- A.  $\pi$
- B.  $2\pi$
- C.  $\pi/2$
- D.  $3\pi/2$

**Answer: C**



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66. If  $a$  is a fixed real number such that  $f(a-x)+f(a+x)=0$ , then  $\int_0^{2a} f(x) dx =$

- A.  $\frac{a}{2}$
- B. 0
- C.  $-\frac{a}{2}$

D. 2a

**Answer: B**



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67. The value of  $\int_0^{\frac{\pi}{2}} \log\left(\frac{4 + 3 \sin x}{4 + 3 \cos x}\right) dx$ , is

A. 2

B.  $3/4$

C. 0

D. 1

**Answer: C**



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68. The value of  $\int_0^1 \tan^{-1}\left(\frac{2x - 1}{1 + x - x^2}\right) dx$  is

A. 1

B. 0

C. -1

D. 2

**Answer: B**

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69. The value of  $\int_0^{2\pi} |\cos x - \sin x| dx$  is

A.  $\frac{4}{\sqrt{2}}$

B.  $2\sqrt{2}$

C.  $\frac{2}{\sqrt{2}}$

D.  $4\sqrt{2}$

**Answer: D**

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70. If  $I_1 = \int_0^1 2^{x^2} dx$ ,  $I_2 = \int_0^1 2^{x^3} dx$ ,  $I_3 = \int_1^2 2^{x^2} dx$   
and  $I_4 = \int_1^2 2^{x^3} dx$  then

A.  $I_1 > I_2$  and  $I_4 > I_3$

B.  $I_2 > I_1$  and  $I_3 > I_4$

C.  $I_1 > I_2$  and  $I_3 > I_4$

D. none of these

**Answer: A**



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71. Consider the integrals

$$I_1 = \int_0^1 e^{-x} \cos^2 x dx, I_2 = \int_0^1 e^{-x^2} \cos^2 x dx, I_3 = \int_0^1 e^{-x^2} dx$$

and  $I_4 = \int_0^1 e^{-(1/2)x^2} dx$ . The greatest of these integrals, is

A.  $I_1$

B.  $I_2$

C.  $I_3$

D.  $I_4$

**Answer: D**



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72. If  $f(x)=f(a+b-x)$  for all  $x \in [a, b]$  and  $\int_a^b x f(x) dx = k \int_a^b f(x) dx$ , then the value of  $k$ , is

A.  $\frac{a + b}{2}$

B.  $\frac{a - b}{2}$

C.  $\frac{a^2 + b^2}{2}$

D.  $\frac{a^2 - b^2}{2}$

**Answer: A**



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73. To find the numerical value of  $\int_{-2}^2 (px^3 + qx + s) dx$  it is necessary to know the values of the constants:

- A. p
- B. q
- C. s
- D. p and s

**Answer: C**



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74. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  be continuous function. Then the value of the integral  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} [f(x) + f(-x)][g(x) - g(-x)] dx$  is (a)  $\pi$  (b) 1 (c)  $-1$  (d) 0

- A.  $\pi$

B. 1

C. -1

D. 0

**Answer: D**



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75. The value of  $\int_{-1/2}^{1/2} x \cos\left(\frac{\pi x}{2}\right) dx$  is

A.  $\frac{\pi\sqrt{2} + 4\sqrt{2} - 8}{\pi^2}$

B.  $\frac{\sqrt{2} + 4\pi\sqrt{2} - 8}{\pi^2}$

C.  $\frac{\pi\sqrt{2} + 4\sqrt{2} + 8}{\pi^2}$

D. none of these

**Answer: A**



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76. The value of the integral  $\int_0^{\pi/2} \frac{f(x)}{f(x) + f\left(\frac{\pi}{2} - x\right)} dx$  is

A.  $\pi/4$

B.  $\pi/2$

C.  $\pi$

D. 0

**Answer: A**



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77. The value of  $\int_{\pi/2}^0 \frac{1}{9 \cos x + 12 \sin x} dx$  is

A.  $\frac{1}{15} \log_{10} 6$

B.  $\frac{1}{15} \log_e 6$

C.  $\log\left(\frac{6}{15}\right)$

D.  $\log\left(\frac{15}{6}\right)$

**Answer: B**

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78. If  $I = \int_3^4 \frac{1}{3\sqrt{\log x}} dx$  then

A.  $I < 1$

B.  $I > 1$

C.  $I < 0.92$

D. none of these

**Answer: A**

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79. If  $I = \int_0^{1/2} \frac{1}{\sqrt{1-x^{2n}}} dx$  then which one of the following is not true

?

A.  $I < \frac{\pi}{6}$

B.  $I \geq \frac{1}{2}$

C.  $I > 0$

D. none of these

**Answer: D**

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80. Q.  $\int_0^{\pi} e^{\cos^2 x} (\cos^3(2n + 1)x) dx, n \in I$

A.  $\pi$

B. 1

C. 0

D. none of these

**Answer: C**

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81. The value of the integral  $\int_0^{2a} \frac{f(x)}{f(x) + f(2a - x)} dx$  is equal to

A. 0

B.  $2a$

C.  $a$

D. none of these

**Answer: C**



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82. If  $\int_0^1 \frac{\log(1+x)}{(1+x^2)} dx =$

A. 4

B. 8

C.  $\pi$

D.  $2\pi$

**Answer: B**



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83. If  $\int_{\log 2}^x \frac{dx}{\sqrt{e^x - 1}} = \frac{\pi}{6}$ , then  $x$  is equal to

(a) 4 (b)  $\ln 8$  (c)  $\ln 4$  (d) none of these

A.  $e^2$

B.  $1/e$

C.  $\log 4$

D. none of these

**Answer: C**



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84. The value of the integral  $\int_0^{\pi} \log(1 + \cos x) dx$  is

A.  $\frac{\pi}{2} \log 2$

B.  $-\pi \log 2$

C.  $\pi \log 2$

D. none of these

**Answer: B**



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85. The value of the integral  $\int_0^{\pi} \frac{1}{a^2 - 2a \cos x + 1} dx$  ( $a > 1$ ), is

A.  $\frac{\pi}{1 - a^2}$

B.  $\frac{\pi}{a^2 - 1}$

C.  $\frac{2\pi}{a^2 - 1}$

D.  $\frac{3\pi}{4}$

**Answer: A**

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86. The integral  $\int_0^{\pi/2} f(\sin 2x) \sin x dx$  is equal to

A.  $\int_0^{\pi/2} f(\cos 2x) \sin x dx = \sqrt{2} \int_0^{\pi/2} f(\cos 2x) \sin x dx$

B.  $\int_0^{\pi/2} f(\sin 2x) \cos x dx = \sqrt{2} \int_0^{\pi/4} f(\cos 2x) \cos x dx$

C.  $\int_0^{\pi/2} f(\cos 2x) \cos x dx = \sqrt{2} \int_0^{\pi/2} f(\cos 2x) \cos x dx$

D.  $\int_0^{\pi/2} f(\sin 2x) \cos x dx = \sqrt{2} \int_0^{\pi/2} f(\cos 2x) \cos x dx$

**Answer: B**

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87.  $\int_0^\pi k(\pi x - x^2)^{100} \sin 2x \, dx$  is equal to

A.  $\pi^{100}$

B.  $\frac{1}{2}(\pi^{100} - \pi^{97})$

C.  $\frac{1}{2}(\pi^{100} + \pi^{97})$

D. 0

Answer: D



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88. The value of the integral  $\int_2^4 \frac{\sqrt{x^2 - 4}}{x^4} dx$  is

A.  $\sqrt{\frac{3}{32}}$

B.  $\frac{\sqrt{3}}{32}$

C.  $\frac{32}{\sqrt{3}}$

D.  $-\frac{\sqrt{3}}{32}$



**Answer: B**



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89. The value of the integral  $\int_0^\pi \frac{1}{a^2 - 2a \cos x + 1} dx (a > 1)$ , is

A.  $\frac{\pi}{1 - a^2}$

B.  $\frac{\pi}{a^2 - 1}$

C.  $\frac{2\pi}{a^2 - 1}$

D.  $\frac{2\pi}{1 - a^2}$

**Answer: B**



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90. If  $f$  and  $g$  are continuous function on  $[0, a]$  satisfying

$f(x) = f(a - x)$  and  $g(x)(a - x) = 2$ , then show that

$$\int_0^a f(x)g(x)dx = \int_0^a f(x)dx.$$

A.  $\int_0^a g(x) dx$

B.  $\int_0^a f(x) dx$

C. 0

D. none of these

**Answer: B**



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91.  $\int_0^{\pi/2} x(\sqrt{\tan x} + \sqrt{\cot x}) dx$  equals

A.  $\frac{\pi}{2\sqrt{2}}$

B.  $\frac{\pi^2}{2}$

C.  $\frac{\pi^2}{2\sqrt{2}}$

D.  $\frac{\pi^2}{2\sqrt{3}}$

**Answer: C**

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92. Choose the correct answer The value of the integral

$$\int_{\frac{1}{3}}^1 \frac{(x - x^3)^{\frac{1}{3}}}{x^4} dx \text{ is (A) 6 (B) 0 (C) 3 (D) 4}$$

A. 6

B. 0

C. 3

D. 4

**Answer: A**

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93. Evaluate:  $\int_0^{100\pi} \sqrt{(1 - \cos 2x)} dx.$

A.  $100\sqrt{2}$

B.  $200\sqrt{2}$

C. 0

D.  $400\sqrt{2}$

**Answer: B**



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94. Evaluate:  $\int_{-\frac{1}{2}}^{\frac{1}{2}} \left[ \left( \frac{x+1}{x-1} \right)^2 + \left( \frac{x-1}{x+1} \right)^2 - 2 \right]^{\frac{1}{2}} dx$

A.  $\log\left(\frac{4}{3}\right)$

B.  $4 \log\left(\frac{3}{4}\right)$

C.  $4 \log\left(\frac{4}{3}\right)$

D.  $\log\left(\frac{3}{4}\right)$

**Answer: C**



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95. The value of the integral  $\int_{1/e}^e |\log x| dx$ , is

A.  $2\left(\frac{e-1}{e}\right)$

B.  $2\left(\frac{1-e}{e}\right)$

C.  $2 - \frac{1}{e}$

D. none of these

**Answer: A**



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96. The value of  $\int_0^{\pi/2} \frac{\sin 8x \log \cot x}{\cos 2x} dx$ , is

A. 0

B.  $\pi$

C.  $\frac{5\pi}{2}$

D.  $\frac{3\pi}{2}$

**Answer: A**

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97. The value of  $\int_0^{\pi/2} x^{10} \sin x \, dx$ , is then the value of  $\mu_{10} + 90\mu_8$ , is

A.  $9\left(\frac{\pi}{2}\right)^8$

B.  $\left(\frac{\pi}{2}\right)^9$

C.  $10\left(\frac{\pi}{2}\right)^9$

D.  $9\left(\frac{\pi}{2}\right)^9$

**Answer: C**

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98. The value of  $\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \tan^3 x}$  is 0 (b) 1 (c)  $\frac{\pi}{2}$  (d)  $\pi$

A. 0

B. 1

C.  $\pi/2$

D.  $\pi/4$

**Answer: D**



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99. The value of  $\int_0^\pi \frac{\sin\left(n + \frac{1}{2}\right)x}{\sin\left(\frac{x}{2}\right)} dx$  is, (a)  $n \in I, n \geq 0$  (b) 0 (c)  $\pi$  (d)

$2\pi$

A.  $\frac{\pi}{2}$

B. 0

C.  $\pi$

D.  $2\pi$

**Answer: C**



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100. If  $\frac{d(f(x))}{dx} = g(x) \forall x \in [a, b]$  then  $\int_a^b f(x) \cdot g(x) dx$  is equal to :

A.  $f(b) - f(a)$

B.  $g(b) - g(a)$

C.  $\frac{[f(b)]^2 - [f(a)]^2}{2}$

D.  $\frac{[g(b)]^2 - [g(a)]^2}{2}$

**Answer: C**

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101. For any integer  $n$ , the integral  $\int_0^{\pi} e^{\sin^2 x} \cos^3(2n+1)x \, dx$  has the value

A.  $\pi$

B. 1



C. 0

D. none of these

**Answer: C**



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102. The value of the integral  $\int_0^3 \sqrt{3+x^3} dx$  lies in the interval

A. (1,3)

B. (2,30)

C.  $(4, 2\sqrt{30})$

D. none of these

**Answer: C**



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103. The value of the integral  $\int_0^1 \frac{1}{(1+x^2)^{3/2}} dx$  is

A.  $1/2$

B.  $1/\sqrt{2}$

C. 1

D.  $\sqrt{2}$

**Answer: B**



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104. If  $I = \int_0^{2\pi} \sin^2 x dx$ , then

A.  $I = 4 \int_0^{\pi} \sin^2 x \, dx = 4 \int_0^{\pi/2} \sin^2 x \, dx$

B.  $I = \int_0^{\pi/2} \cos^2 x \, dx$

C.  $I = 8 \int_0^{\pi/4} \sin^2 x \, dx$

D. none of these

**Answer: D**

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105. If  $\int_0^1 f(x) dx = M$ ,  $\int_0^1 g(x) dx = N$ , then which of the following is correct ?

A.  $\int_0^1 (f(x) + g(x)) dx = M + N$

B.  $\int_0^1 (f(x) + g(x)) dx = MN$

C.  $\int_0^1 (1/f(x)) dx = (1/M)$

D.  $\int_0^1 \frac{f(x)}{g(x)} dx = \frac{M}{N}$

**Answer: A**

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106. The value of  $\int_0^{\pi/4} (\pi x - 4x^2) \log(1 + \tan x) dx$  is

A.  $\frac{\pi^3}{192} \log_e 2$

B.  $\frac{\pi^3}{192} \log \sqrt{2}$

C.  $\frac{\pi^3}{36} \log 2$

D.  $\frac{\pi^3}{48} \log \sqrt{2}$

Answer: A



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107. The value of  $\int_{-\pi/2}^{\pi/2} \sin \left\{ \log \left( x + \sqrt{x^2 + 1} \right) \right\} dx$  is

A. 1

B. -1

C. 0

D. none of these

**Answer: C**



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108. The value of  $\int_0^{2\pi} \cos^{99} x dx$ , is

A. 1

B. -1

C. 99

D. 0

**Answer: D**



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109. If  $f(a+x)=f(x)$ , then  $\int_0^{na} f(x) dx$  is equal to ( $n \in N$ )

A.  $(n - 1) \int_0^a f(x) dx$

B.  $n \int_0^a f(x) dx$

C.  $\int_0^{(n-1)a} f(x) dx$

D. none of these

**Answer: B**



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110. If  $f(t)$  is an odd function, then prove that  $\varphi(x) = \int_a^x f(t) dt$  is an even function.

A. is an odd function

B. is an even function

C. is an increasing function on  $[a,b]$

D. none of these

**Answer: B**





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111. If  $f(x)$  is an integrable function over every interval on the real line such that  $f(t+x)=f(x)$  for every  $x$  and real  $t$ , then

$\int_a^{a+t} f(x) dx$  is equal to

A.  $\int_0^a f(x) dx$

B.  $\int_0^t f(x) dx$

C.  $\int_a^t f(x) dx$

D. none of these

**Answer: B**



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112. If  $I_1 = \int_{3\pi}^0 f(\cos^2 x) dx$  and  $I_2 = \int_{\pi}^0 f(\cos^2 x) dx$  then

A.  $I_1 = I_2$

B.  $I_1 = 2I_2$

C.  $I_1 = 5I_2$

D. none of these

**Answer: D**



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**113.** If  $f(x)$  is a quadratic polynomial in  $x$  such that

$$6 \int_0^1 f(x) dx - \left\{ f(0) + 4f\left(\frac{1}{2}\right) \right\} = kf(1), \text{ then } k =$$

A. -1

B. 0

C. 1

D. 2

**Answer: C**





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114. The value of integral  $\int_{-2}^4 x[x] dx$  is

A.  $41/2$

B. 20

C.  $21/2$

D. none of these

Answer: A



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115. If  $h(a)=h(b)$ , the value of the integral

$\int_a^b [f(g(h(x)))]^{-1} f'(g(h(x))) g'(h(x)) h'(x) dx$  is equal to

A. 0

B.  $f(a)-f(b)$

C.  $f(g(a))-f(g(b))$

D. none of these

**Answer: A**



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116. Given that,  $F(x) = \frac{1}{x^2} \int_4^x (4t^2 - 2F'(t)) dt$ , find  $F'(4)$ .

A. 32

B.  $32/3$

C.  $32/9$

D. none of these

**Answer: C**



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117. It is known that  $f(x)$  is an odd function in the interval  $\left[\frac{p}{2}, \frac{p}{2}\right]$  and has a period  $p$ , Prove that  $\int_q^x (t)dt$  is also periodic function with the same period.

- A. a periodic function with period  $T/2$
- B. a periodic function with period  $T$
- C. not a periodic function
- D. a periodic function with period  $T/4$

**Answer: B**

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118. Suppose for every integer  $n$ ,  $\int_n^{n+1} f(x)dx = n^2$ . The value of

$\int_{-2}^4 f(x)dx$  is :

- A. 16

B. 14

C. 19

D. none of these

**Answer: C**



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119.  $\int_{-\pi+4}^{\pi/4} \frac{\tan^2 x}{1+a^x} dx$  is equal to

A.  $\frac{\pi + 4}{4}$

B.  $\frac{\pi - 4}{4}$

C.  $\frac{a\pi}{4}$

D.  $\frac{a + \pi}{4}$

**Answer: B**



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120. The value of  $\int_0^{\pi/2} \cos ec(x - \pi/3) \cos ec(x - \pi/6) dx$  is

- A.  $2 \log 3$
- B.  $-2 \log 3$
- C.  $\log 3$
- D. none of these

**Answer: B**



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121. The value of  $\int_{-1}^1 (x|x|) dx$  is equal to

- A. 2
- B. 1
- C. 0
- D. none of these

**Answer: C**

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122.  $\int_0^3 |x^3 + x^2 + 3x| dx$  is equal to

A.  $\frac{171}{2}$

B.  $\frac{171}{4}$

C.  $\frac{170}{4}$

D.  $\frac{170}{3}$

**Answer: B**

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123. Evaluate:  $\int_{-1}^1 \frac{x^3 + |x| + 1}{x^2 + 2|x| + 1} dx$

A.  $\ln 3$

B.  $2 \ln 3$

C.  $\frac{1}{2} \ln 3$

D. none of these

**Answer: D**



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124. Evaluate:  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \log \left\{ \frac{ax^2 + bx + c}{ax^2 - bx + c} (a + b) |\sin x| \right\} dx$

A.  $\pi \log_e (a + b)$

B.  $\pi \log_e \left( \frac{a + b}{2} \right)$

C.  $\frac{\pi}{2} \log_e (a + b)$

D. none of these

**Answer: B**



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125. For any natural number  $n$ , the value of the integral

$$\int_0^{\sqrt{n}} [x^2] dx \text{ is}$$

A.  $n\sqrt{n} + \sum_{r=1}^n \sqrt{r}$

B.  $n\sqrt{n} - \sum_{r=1}^n \sqrt{r}$

C.  $\sum_{r=1}^n \sqrt{r} - n\sqrt{n}$

D. none of these

**Answer: B**



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126. For any  $n \in \mathbb{R}^+$ , the value of the integral

$$\int_0^{n[x]} (x - [x]) dx \text{ is}$$

A.  $n[x]$

B.  $[x]$



C.  $\frac{n}{2}[x]$

D. none of these

**Answer: C**



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127. Let  $d/(dx)F(x) = (e^{\sin x})/x, x > 0$ . If  $\int_1^k \frac{3}{x} e^{\sin(x^3)} dx = F(k) - F(1)$ , then one of the possible values of  $k$ , is: (a) 15 (b) 16 (c) 63 (d) 64

A. 27

B. 18

C. 9

D. none of these

**Answer: A**



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128. The equation

$$\int_{-\pi/4}^{\pi/4} \left\{ a|\sin x| + \frac{b \sin x}{1 + \cos x} + c \right\} dx = 0 \text{ where } a, b, c \text{ are constants,}$$

gives a relation between

- A. a, b and c
- B. a and c
- C. a and b
- D. b and c

**Answer: B**



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129. Let  $f(x)$  be a continuous function such that  $f(a - x) + f(x) = 0$

for all  $x \in [0, a]$ . Then the value of the integral  $\int_0^a \frac{1}{1 + e^{f(x)}} dx$  is equal

to

- A. a

B.  $\frac{a}{2}$

C.  $f(a)$

D.  $\frac{1}{2}f(a)$

**Answer: B**

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130. The value of  $\int_{\alpha}^{\beta} x|x|dx$ , where  $a < 0 < \beta$ , is

A.  $\frac{1}{2}(\alpha^2 + \beta^2)$

B.  $\frac{1}{3}(\beta^2 - \alpha^2)$

C.  $\frac{1}{3}(\alpha^3 + \beta^3)$

D. none of these

**Answer: C**

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131.  $\int_{-\pi/2}^{\pi/2} \frac{|x|}{8 \cos^2 2x + 1} dx$  has the value

A.  $\frac{\pi^2}{6}$

B.  $\frac{\pi^2}{12}$

C.  $\frac{\pi^2}{24}$

D. none of these

**Answer: B**



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132. If  $[.]$  denotes the greatest integer function and

$$f(x) = \begin{cases} 3(x) - \frac{5|x|}{x}, & x \neq 0 \\ 2, & x = 0 \end{cases}$$

then  $\int_{-3/2}^2 f(x) dx$  is equal to

A.  $-\frac{11}{2}$

B.  $-\frac{7}{2}$

C. -6

D.  $-\frac{17}{2}$

**Answer: A**



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133. Find the value of  $\int_{-1}^1 [x^2 + \{x\}] dx$ , where  $[.]$  and  $\{.\}$  denote the greatest function and fractional parts of  $x$ , respectively.

A.  $\frac{5 + \sqrt{5}}{2}$

B.  $\frac{5 - \sqrt{5}}{2}$

C.  $-\frac{5 + \sqrt{5}}{2}$

D. none of these

**Answer: B**



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134. The value of

$$\int_{-1}^1 \sin^{-1} \left[ x^2 + \frac{1}{2} \right] dx + \int_{-1}^1 \cos^{-1} \left[ x^2 - \frac{1}{2} \right] dx, \text{ where } [.] \text{ denotes the}$$

greatest integer function, is

A.  $\pi$

B.  $2\pi$

C.  $4\pi$

D. 0

Answer: B

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135. Let  $\Delta(y) = \begin{vmatrix} y+a & y+b & y+a-c \\ y+b & y+c & y-1 \\ y+c & y+d & y-b+d \end{vmatrix}$

and,  $\int_0^2 \Delta(y) dy = -16$ , where a,b,c,d are in A.P., then the common difference of the A.P. is equal to

A.  $\pm 1$

B.  $\pm 2$

C.  $\pm 3$

D. none of these

**Answer: B**



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136. If  $I = \int_0^1 \frac{1}{1+x^{\pi/2}} dx$ , then\

A.  $I > \ln 2$

B.  $I < \ln 2$

C.  $I < \frac{\pi}{4}$

D.  $I > \frac{\pi}{4}$

**Answer: A**



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137. If  $\int_0^x f(t) dt = x^2 + 2x - \int_0^x t f(t) dt, x \in (0, \infty)$ . Then,  $f(x)$  is

- A. Periodic
- B. Periodic but fundamental does not exist
- C. Periodic but fundamental period exists
- D. Nothing can be said

**Answer: A::B**



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138. If  $f(x) = \min \left( |x|, 1 - |x|, \frac{1}{4} \right) \forall x \in R$ , then find the value of

$$\int_{-1}^1 f(x) dx.$$

- A. 40
- B. 50
- C. 1



D.  $\frac{2}{5}$

**Answer: A**



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139. If  $I_n = \int_0^\pi e^x (\sin x)^n dx$ , then  $\frac{I_3}{I_1}$  is equal to

A.  $\frac{3}{5}$

B.  $\frac{1}{5}$

C. 1

D.  $\frac{2}{5}$

**Answer: A**



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140. Given that

$$\lim_{n \rightarrow \infty} \sum_{r=1}^n \frac{\log(n^2 + r^2) - 2 \log n}{n} = \log 2 + \frac{\pi}{2} - 2, \text{ then}$$

$$\lim_{n \rightarrow \infty} \frac{1}{n^{2m}} \left[ (n^2 + 1^2)^m (n^2 + r^2)^m \dots (n^2)^m \right]^{1/n} \text{ is equal to}$$

A.  $2^m e^{m\left(\frac{\pi}{2} - 2\right)}$

B.  $2^m e^{m\left(2 - \frac{\pi}{2}\right)}$

C.  $e^m \left(\frac{\pi}{2} - 2\right)$

D.  $e^{2m\left(\frac{\pi}{2} - 2\right)}$

Answer: A



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141. Let  $f$  be a differentiable function such that

$$f'(x) = f(x) + \int_0^2 f(x) dx \text{ and } f(0) = \frac{4 - e^2}{3}. \text{ Find } f(x).$$

A.  $e^x - \left(\frac{e^2 - 1}{3}\right)$

B.  $e^x + \left(\frac{e^2 - 1}{3}\right)$

C.  $e^x - \left(\frac{e^2 + 1}{3}\right)$

D. none of these

**Answer: A**



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**142.** Let  $f$  be a differentiable function such that

$$f'(x) = f(x) + \int_0^2 f(x) dx \text{ and } f(0) = \frac{4 - e^2}{3}. \text{ Find } f(x).$$

A. 0

B. 1

C. 2

D. 3

**Answer: B**



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143. The value of the integral  $\int_{-10}^0 \frac{\left| \frac{2|x|}{[x] - 3x} \right|}{\left( \frac{2|x|}{3x - [x]} \right)} dx$  where  $[.]$  denotes GIF

A.  $\frac{28}{3}$

B. 0

C. 10

D. -10

**Answer: A**



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## Chapter Test 1

1.  $\int_{-\pi/2}^{\pi/2} \sin^2 x \cos^2 x (\sin x \cos x) dx =$

A.  $2/15$

B.  $4/15$

C.  $2/15$

D. 0

**Answer: D**



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2.  $\lim_{n \rightarrow \infty} \frac{1}{n^2} \sum_{r=1}^n r e^{r/n} =$

A. 0

B. 1

C. e

D.  $2e$

**Answer: B**



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3. The value of the integral  $\int_{-1}^1 \sin^{11} x \, dx$  is

A.  $\frac{10}{11} \cdot \frac{8}{9} \cdot \frac{6}{7} \cdot \frac{4}{5} \cdot \frac{2}{3}$

B.  $\frac{10}{11} \cdot \frac{8}{9} \cdot \frac{6}{7} \cdot \frac{4}{5} \cdot \frac{2}{3} \cdot \frac{\pi}{2}$

C. 1

D. 0

**Answer: D**



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4. The value of  $\int_{-\pi}^{\pi} (1 - x^2) \sin x \cos^2 x \, dx$ , is

A. 0

B.  $\pi - \frac{\pi^3}{3}$

C.  $2\pi - \pi^3$

D.  $\frac{\pi}{2} - 2\pi^3$

**Answer: A**



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5.  $\int_{-\pi}^{\pi} [\cos px - \sin qx]^2 dx$  where  $p, q$  are integers is equal to

A.  $-\pi$

B. 0

C.  $\pi$

D.  $2\pi$

**Answer: D**



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6. about to only mathematics

A.  $1/2$

B.  $1/3$

C.  $1/4$

D.  $1/8$

**Answer: C**



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7. The value of  $\int_3^5 \frac{x^2}{x^2 - 4} dx$ , is

A.  $2 - \log_e \left( \frac{15}{7} \right)$

B.  $2 + \log_e \left( \frac{15}{7} \right)$

C.  $2 + 4 \log_e 3 - 4 \log_e 7 + 4 \log_e 5$

D.  $2 - \tan^{-1} \left( \frac{15}{7} \right)$

**Answer: B**



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8. The greater value of  $(x) = \int_{-1/2}^x |t| dt$  on the interval  $[-1/2, 1/2]$ , is

A.  $\frac{3}{8}$

B.  $\frac{1}{4}$

C.  $-\frac{3}{8}$

D.  $-\frac{1}{2}$

**Answer: B**



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9.  $f(x) = \begin{cases} 1 - x, & 0 \leq x \leq 1 \\ 0, & 1 \leq x \leq 2 \\ (2 - x)^2, & 2 \leq x \leq 3 \end{cases}$  and  $\phi(x) = \int_0^x f(t) dt$ . Then for any

$x \in [2, 3]$ ,  $\phi(x)$  equals

A.  $\frac{(x - 2)^3}{3}$

B.  $\frac{1}{2} - \frac{(x - 2)^3}{3}$

C.  $\frac{1}{2} + \frac{(x - 2)^3}{3}$

D. none of these

**Answer: C**

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10. If  $f(x) = \int_{-1}^x |t| dt$ , then for any  $x \geq 0$ ,  $f(x)$  equals

A.  $\frac{1}{2}(1 - x^2)$

B.  $\frac{1}{2}x^2$

C.  $\frac{1}{2}(1 + x^2)$

D. none of these

**Answer: C**

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11.  $\int_0^2 (x - \log_2 a) dx = 2 \log\left(\frac{2}{a}\right)$ , if

A.  $a=2$

B.  $a > 2$

C. 3

D. 4

**Answer: A**



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12. If  $\int_1^a (a - 4x)dx \geq 6 - 5a$ ,  $a > 1$ , then  $a$  equals

A. 1

B. 2

C. 3

D. 4

**Answer: B**



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13. The value of  $\int_1^2 \{f(g(x))\}^{-1} f'(g(x))g'(x) dx$  , where  $g(1)=g(2)$ , is equal to

A. 1

B. 2

C. 0

D. none of these

**Answer: C**



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14. If  $\frac{C_0}{1} + \frac{C_1}{2} + \frac{C_2}{3} = 0$  , where  $C_0, C_1, C_2$  are all real, the equation  $C_2x^2 + C_1x + C_0 = 0$  has

A. at least one root in (0,1)

B. one root in (1,2) and the other in (3,4)

C. one root in  $(-1,1)$  and the other in  $(-5,2)$

D. both roots imaginary

**Answer: A**



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15. The solution of the equation  $\int_{\log_2}^x \frac{1}{e^x - 1} dx = \frac{\log(3)}{2}$  is given by  $x =$

A.  $e^2$

B.  $1/e$

C.  $\log 4$

D. none of these

**Answer: C**



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16. If  $\int_a^b \frac{x^n}{x^n + (16 - x)^n} dx = 6$ , then

A.  $a = 4, b = 12, n \in R$

B.  $a = 2, b = 14, n \in R$

C.  $a = -4, b = 20, n \in R$

D.  $a = 2, b = 8, n \in R$

**Answer: B**

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17. Let  $m$  be any integer. Then, the integral  $\int_0^\pi \frac{\sin 2mx}{\sin x} dx$  equals

A. 0

B.  $\pi$

C. 1

D. none of these

**Answer: A**



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18.  $\int_{-\pi/4}^{\pi/4} e^{-x} \sin x \, dx$  is

A.  $-\frac{\sqrt{2}}{2} e^{-\pi/4}$

B.  $\frac{\sqrt{2}}{2} e^{-\pi/4}$

C.  $\sqrt{2}(e^{-\pi/4} - e^{\pi/4})$

D. zero

**Answer: A**



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19. If  $\frac{d(f(x))}{dx} = g(x) \forall x \in [a, b]$  then  $\int_a^b f(x) \cdot g(x) dx$  is equal to :

A.  $f(b) - f(a)$

B.  $\phi(b) - \phi(a)$

C.  $\frac{[f(b)]^2 - [f(a)]^2}{1 + e^x}$

D.  $\frac{[\phi(b)]^2 - [\phi(a)]^2}{2}$

**Answer: C**

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20. Evaluate :  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1 + e^x} dx$

A. 1

B. 0

C. -1

D. none of these

**Answer: A**

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21.  $\int_0^{\infty} \frac{dx}{[x + \sqrt{x^2 + 1}]^3} dx =$

A.  $\frac{3}{8}$

B.  $\frac{1}{8}$

C.  $-\frac{3}{8}$

D. none of these

**Answer: A**



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22.  $\int_0^1 \frac{x}{(1-x)^{3/4}} dx =$

A.  $\frac{12}{5}$

B.  $\frac{16}{5}$

C.  $-\frac{16}{5}$

D. none of these

**Answer: B**



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23.  $\int_0^{\pi} x \sin x \cos^4 x dx =$

A.  $\frac{\pi}{10}$

B.  $\frac{\pi}{5}$

C.  $-\frac{\pi}{5}$

D. none of these

**Answer: B**



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24.  $\int_0^{\pi} [2 \sin x] dx =$

A.  $2\pi / 3$

B.  $-5\pi/3$

C.  $-\pi$

D.  $-2\pi$

**Answer: A**

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25.  $\int_{\pi/2}^{3\pi/2} [2 \cos x] dx$  is equal to

A.  $\frac{5\pi}{3}$

B.  $-\frac{5\pi}{3}$

C.  $-\pi$

D.  $-2\pi$

**Answer: B**

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26. If  $f(x)$  satisfies the condition of Rolle's theorem in  $[1, 2]$  then

$\int_1^2 f'(x) dx$  is equal to (A) 1 (B) 3 (C) 0 (D) none of these

A. 3

B. 0

C. 1

D. 2

**Answer: B**



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27. The tangent lines for the curve  $y = \int_0^x 2|t| dt$  which are parallel to

the bisector to the bisector of the first coordinate angle, is given by

A.  $y = x \pm \frac{1}{4}$

B.  $y = x \pm \frac{3}{2}$

C.  $y = x \pm \frac{1}{2}$

D. none of these

**Answer: A**



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28. If  $f(x) = ae^{2x} + be^x + cx$ , satisfies the conditions  $f(0)=-1$ ,  $f'(\log 2)=31$ ,

$$\int_0^{\log 4} (f(x) - cx) dx = \frac{39}{2}, \text{ then}$$

A.  $a=5, b=6, c=3$

B.  $a=5, b=-6, c=3$

C.  $a=-5, b=6, c=3$

D. none of these

**Answer: B**



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29.  $\int_{\pi}^{2\pi} [\sqrt{2} \cos x] dx =$

A.  $-\pi/2$

B.  $\pi/2$

C.  $\pi$

D. none of these

**Answer: A**



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30.  $\int_0^{\pi/3} [\sqrt{3} \tan x] dx =$

A.  $\frac{5\pi}{6}$

B.  $\frac{5\pi}{6} - \tan^{-1}\left(\frac{2}{\sqrt{2}}\right)$

C.  $\frac{\pi}{2} - \tan^{-1}\left(\frac{2}{\sqrt{2}}\right)$

D. none of these

**Answer: D**

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31.  $\int_{3\pi/2}^{5\pi/3} [2 \cos x] dx =$

A.  $\frac{5\pi}{3}$

B.  $\frac{4\pi}{3}$

C.  $\frac{2\pi}{3}$

D. none of these

**Answer: D**

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32.  $\int_0^{50\pi} |\cos x| dx =$

A. 100

B. 50

C. 0

D. none of these

**Answer: A**



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33. The values of 'a' for which  $\int_0^a (3x^2 + 4x - 5)dx < a^3 - 2$  are

A.  $\frac{1}{2} < a < 2$

B.  $\frac{1}{2} \leq a \leq 2$

C.  $a \leq \frac{1}{2}$

D.  $a \geq 2$

**Answer: A**



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34. If  $(-1,2)$  and  $(2,4)$  are two points on the curve  $y=f(x)$  and if  $g(x)$  is the gradient of the curve at point  $(x,y)$  then the value of the integral

$$\int_{-1}^2 g(x)dx \text{ is}$$

A. 2

B. -2

C. 0

D. 1

**Answer: A**



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35. If  $I_1 = \int_{1-x}^x x \sin\{x(1-x)\}dx$  and  $I_2 = \int_{1-x}^x \sin\{x(1-x)\}dx$ ,

then

A.  $I_1 2I_2$

B.  $2I_1 = I_2$

C.  $I_1 = I_2$

D. none of these

**Answer: B**



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36. If  $\int_{-\pi/3}^{\pi/3} \left( \frac{a}{3} |\tan x| + \frac{b \tan x}{1 + \sec x} + c \right) dx = 0$  where a, b, c are constants, then c =

A.  $a \ln 2$

B.  $\frac{a}{\pi} \ln 2$

C.  $-\frac{a}{\pi} \ln 2$

D.  $\frac{2a}{\pi} \ln 2$

**Answer: C**



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37. Estimate the absolute value of the integral  $\int_{10}^{19} \frac{\sin x}{1+x^8} dx$

A.  $10^{-10}$

B.  $10^{-11}$

C.  $10^{-7}$

D.  $10^{-9}$

**Answer: C**



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38. The smallest interval  $[a,b]$  such that

$$\int_0^1 \frac{1}{\sqrt{1+x^4}} dx \in [a, b], \text{ is}$$

A.  $\left[ \frac{1}{\sqrt{2}}, 1 \right]$

B.  $[0,1]$

C.  $\left[ \frac{1}{2}, 1 \right]$

D.  $\left[\frac{3}{4}, 1\right]$

**Answer: A**



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39. Let  $I_n = \int_0^{\pi/2} \sin^n x dx, n \in N$ . Then

A.  $I_n : I_{n-2} = n : (n - 1)$

B.  $I_n > I_{n-2}$

C.  $n(I_{n-2} - I_n) = I_{n-2}$

D. none of these

**Answer: C**



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40. If  $f(x) = \int_0^x \sin^4 t dt$ , then  $f(x + 2\pi)$  is equal to

A.  $f(x)$

B.  $f(x) + f(2\pi)$

C.  $gf(x) - f(2\pi)$

D.  $f(x) \cdot f(2\pi)$

**Answer: B**

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41.  $\int_0^\pi \frac{dx}{1 + 3^{\cos x}}$  is equal to:

A.  $\pi$

B. 0

C.  $\pi/2$

D. none of these

**Answer: C**

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42. Let  $\int_0^a f(x)dx = \lambda$  and  $\int_0^a f(2a - x)dx = \mu$ . Then  $\int_0^{2a} f(x)dx$  is :

- A.  $\lambda + \mu$
- B.  $\lambda - \mu$
- C.  $2\lambda - \mu$
- D.  $\lambda - 2\mu$

**Answer: A**



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43. Evaluate :  $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{x}{1 + \sin x} dx$

- A.  $(\sqrt{2} - 1)\pi$
- B.  $(\sqrt{2} + 1)\pi$
- C.  $\pi$

D. none of these

**Answer: A**

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44. Let  $I_n = \int_0^{\pi/2} \cos^n x \cos nx dx$ . Then,  $I_n : I_{n+1}$  is equal to

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45. The value of  $\int_{-1}^1 \max [2 - x, 2, 1 + x] dx$  is

A. 4

B.  $9/2$

C. 2

D. none of these

**Answer: B**



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46.  $\int_0^{\pi/4} \sin(x - [x]) dx$  is equal to

A.  $\frac{1}{2}$

B.  $1 - \frac{1}{\sqrt{2}}$

C. 1

D. none of these

Answer: B



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47. The value of the integral  $\int_{-1}^1 (x - [2x]) dx$ , is

A. 1

B. 0



C. 2

D. 4

**Answer: A**



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48. Let  $f: R \rightarrow R$  be a continuous function such that  $f(1)=2$ . If

$$\lim_{x \rightarrow 1} \int_2^{f(x)} \frac{2t}{x-1} dt = 4, \text{ then the value of } f'(1) \text{ is}$$

A. 1

B. 2

C. 4

D. none of these

**Answer: A**



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49. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a continuous function such that  $f(x)$  is not identically equal to zero. If  $\int_0^x |x - 2| dx, x \geq 0$ . Then,  $f'(x)$  is

- A. an even function
- B. an odd function
- C. a periodic function
- D. none of these

**Answer: D**



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50. Let  $f(x) = \int_0^x |x - 2| dx, x \geq 0$ . Then,  $f'(x)$  is

- A. continuous and non differentiable at  $x=2$
- B. discontinuous at  $x=4$
- C. neither continuous nor differentiable at  $x=2$
- D. non-differentiable at  $x=4$

**Answer: A**



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51.  $\lim_{n \rightarrow \infty} \left\{ \frac{n!}{(kn)^n} \right\}^{\frac{1}{n}}$ ,  $k \neq 0$ , is equal to (A)  $\frac{k}{e}$  (B)  $\frac{e}{k}$  (C)  $\frac{1}{ke}$  (D) none

of these

A.  $ke$

B.  $\frac{e}{k}$

C.  $\frac{k}{e}$

D.  $\frac{1}{ke}$

**Answer: D**



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52.  $\int_0^{\sqrt{2}} [x^2] dx$ , is

A.  $2 - \sqrt{2}$

B.  $2 + \sqrt{2}$

C.  $\sqrt{2} - 1$

D.  $\sqrt{2} - 2$

**Answer: C**

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53. Let  $f(x)$  be a function satisfying  $f'(x) = f(x)$ ,  $f(0) = 1$  and  $g$  be a function satisfying  $f(x) + g(x) = x^2$  then  $\int_0^1 f(x)g(x)dx$  equals

A.  $e + \frac{e^2}{2} + \frac{5}{2}$

B.  $e - \frac{e^2}{2} - \frac{5}{2}$

C.  $e + \frac{e^2}{2} - \frac{3}{2}$

D.  $e - \frac{e^2}{2} - \frac{3}{2}$

**Answer: D**



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54.  $\left( \sum_{n=1}^{10} \int_{-2n-1}^{-2n} \sin^{27}(x) dx + \sum_{n=1}^{10} \int_{2n}^{2n+1} \sin^{27}(x) dx \right)$

A.  $27^2$

B. -54

C. 54

D. 0

Answer: D



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55. If  $f(y) = e^y$ ,  $g(y) = y$ ,  $y > 0$  and  $F(t) = \int_0^1 f(t-y)g(y)dt$  then

A.  $F(t) = te^{-t}$

B.  $F(t) = 1 - e^{-t}(t+1)$

C.  $F(t) = e^t - (1 + t)$

D.  $F(t) = te^t$

**Answer: D**

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56. If  $I_n = \int_0^{\pi/2} x^n \sin x dx$ , then  $I_4 + 12I_2$  is equal to\

A.  $4\pi$

B.  $3\left(\frac{\pi}{2}\right)^3$

C.  $\left(\frac{\pi}{2}\right)^2$

D.  $4\left(\frac{\pi}{2}\right)^3$

**Answer: C**

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57.  $\int_0^1 \sin \left\{ 2 \tan^{-1} \sqrt{\frac{1+x}{1-x}} \right\} dx =$

A.  $\pi/6$

B.  $\pi/4$

C.  $\pi/2$

D.  $\pi$

**Answer: B**



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## Chapter Test 2

1. The value of the integral  $\int_0^2 x[x] dx$

A.  $\frac{7}{2}$

B.  $\frac{3}{2}$

C.  $\frac{5}{2}$

D. none of these

**Answer: B**



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2. The value of integral  $\sum_{k=1}^n \int_0^1 f(k-1+x) dx$  is

A.  $\int_0^1 f(x) dx$

B.  $\int_0^2 f(x) dx$

C.  $\int_0^2 f(x) dx$

D.  $n \int_0^2 f(x) dx$

**Answer: C**



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3. Let  $f(x)$  be a function satisfying  $f'(x) = f(x)$  with  $f(0) = 1$  and  $g$  be the function satisfying  $f(x) + g(x) = x^2$

The value of integral  $\int f(x)g(x)dx$  is

A.  $\frac{1}{4}(e - 7)$

B.  $\frac{1}{4}(e - 2)$

C.  $\frac{1}{4}(e - 3)$

D. none of these

**Answer: D**



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4. If  $I = \int_0^1 \cos \left( 2 \cot^{-1} \sqrt{\left( \frac{1-x}{1+x} \right)} \right) dx$  then :

A.  $I > \frac{1}{2}$

B.  $I = -\frac{1}{2}$

C.  $0 < I < \frac{1}{2}$

D.  $I = \frac{1}{2}$

**Answer: B**

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5. The value of  $\int_a^{a+(\pi/2)} (\sin^4 x + \cos^4 x) dx$  is

A.  $\frac{3\pi}{8}$

B.  $a\left(\frac{\pi}{2}\right)^2$

C.  $\frac{3\pi a^2}{8}$

D. none of these

**Answer: A**

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6. The value of  $\int_{-1}^2 \frac{|x|}{x} dx$  is

- A. 0
- B. 1
- C. 3
- D. none of these

**Answer: B**



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7. The value of  $\int_0^1 \frac{x^3}{1+x^8} dx$  is

- A.  $\frac{\pi}{4}$
- B.  $\frac{\pi}{8}$
- C.  $\frac{\pi}{16}$
- D. none of these

**Answer: C**



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8. The value of  $\int_0^3 x\sqrt{1+x}dx$ , is

A.  $\frac{9}{2}$

B.  $\frac{27}{4}$

C.  $\frac{126}{15}$

D.  $\frac{116}{15}$

**Answer: D**



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9. Evaluate  $\int_0^1 \log\left(\sin\left(\frac{\pi x}{2}\right)\right) dx$

A.  $\log 2$

B.  $-\log 2$

C.  $\frac{\pi}{2}\log 2$

D.  $-\frac{\pi}{2}\log 2$

**Answer: B**

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10. Evaluate  $\int_0^{\pi} x \log \sin x dx$

A.  $\frac{\pi}{2}\log 2$

B.  $\frac{\pi^2}{2}\log 2$

C.  $-\frac{\pi^2}{2}\log 2$

D. none of these

**Answer: C**

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11. If  $I_1 = \int_0^{\infty} \frac{dx}{1+x^4}$  and  $I_2 = \int_0^{\infty} x^2 \frac{dx}{1+x^4}$  then  $\frac{I_1}{I_2} =$

A. 1

B. 2

C. 1/2

D. none of these

**Answer: A**



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12. If  $f(x) = \begin{cases} x & x < 1 \\ x - 1 & x \geq 1 \end{cases}$ , then  $\int_0^2 x^2 f(x) dx$  is equal to :

A. 1

B.  $\frac{4}{3}$

C.  $\frac{5}{3}$

D.  $\frac{5}{2}$

**Answer: C**

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13. The value of the integral  $\int_0^1 \frac{1}{(1+x^2)^{3/2}} dx$  is

A.  $1/2$

B.  $\sqrt{2}/2$

C. 1

D.  $\sqrt{2}$

**Answer: B**

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14. Prove that:  $\int_0^{2a} f(x) dx = \int_0^{2a} f(2a-x) dx$ .

A.  $f(2a - x) = -f(x)$

B.  $f(2a - x) = f(x)$

C.  $f(x)$  is an odd function

D.  $f(x)$  is an even function

**Answer: B**

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15. If  $\int_0^{36} \frac{1}{2x + 9} dx = \log k$ , is equal to

A. 3

B.  $9/2$

C. 9

D. 81

**Answer: A**

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16. The value of the integral  $\int_0^{\pi/2} \sin^6 x dx$ , is

A.  $\frac{3\pi}{4}$

B.  $\frac{5}{32}\pi$

C.  $\frac{3}{16}\pi$

D. none of these

**Answer: B**



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17. If  $\int_0^{\infty} e^{-x^2} dx = \sqrt{\frac{\pi}{2}}$  then  $\int_0^{\infty} e^{-ax^2} dx$ ,  $a > 0$ , is

A.  $\frac{\sqrt{\pi}}{2}$

B.  $\frac{\sqrt{\pi}}{2a}$

C.  $2\frac{\sqrt{\pi}}{a}$

D.  $\frac{1}{2} \left( \sqrt{\frac{\pi}{a}} \right)$

**Answer: D**



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18. The value of the integral  $\int_0^{\infty} \frac{1}{1+x^4} dx$  is

A.  $\frac{\pi}{2}$

B.  $\frac{\pi}{\sqrt{2}}$

C.  $\frac{\pi}{2\sqrt{2}}$

D. none of these

**Answer: C**



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19. The value of  $\alpha \in [0, 2\pi]$  which does not satisfy the equation

$$\int_{\pi/2}^{\alpha} \sin x dx = \sin 2\alpha, \text{ is}$$

A.  $\pi$

B.  $\frac{3\pi}{2}$

C.  $\frac{7\pi}{6}$

D.  $\frac{11\pi}{6}$

**Answer: A**



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20.  $\lim_{x \rightarrow 0} \frac{\int_0^{x^2} \sin \sqrt{t} dt}{x^3}$  is equal to

A.  $1/3$

B.  $1$

C.  $2/3$

D. none of these

Answer: C



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21.

If

$$\left[ \int_0^1 \frac{dt}{t^2 + 2t \cos \alpha + 1} \right] x^2 - \left[ \int_{-3}^3 \frac{t^2 \sin 2t}{t^2 + 1} dt \right] x - 2 = 0 (0 < \alpha < \pi)$$

then the value of x is

A.  $\pm 2\sqrt{\frac{\sin \alpha}{\alpha}}$

B.  $\pm \sqrt{\frac{\sin \alpha}{\alpha}}$

C.  $\pm 4\sqrt{\frac{\sin \alpha}{\alpha}}$

D. none of these

Answer: A



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22. The number of value of  $\alpha$  in the interval  $[-\pi, 0]$  satisfying

$$\sin \alpha + \int_{\alpha}^{2\alpha} \cos 2x dx = 0, \text{ then}$$

A.  $-\pi/2$

B.  $-\pi$

C.  $-\pi/3$

D.  $\pi$

**Answer: C**



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23. The value of  $\int_0^{\pi/2} \frac{\sin^3 x \cos x}{\sin^4 x + \cos^4 x} dx$  is

A.  $\pi/8$

B.  $\pi/4$

C.  $\pi/2$

D.  $\pi$

**Answer: A**



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24. The value of  $\int_0^{\pi} \frac{1}{5 + 3 \cos x} dx$  is

a.  $\pi / 2$

b.  $\pi / 4$

c. 0

d.  $\pi / 8$

A.  $\pi$

B.  $2\pi / 3$

C.  $\pi / 4$

D. 2

**Answer: C**



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25.  $\lim_{n \rightarrow \infty} [\sin'(\pi)/(n) + \sin'(2\pi)/(n) + \dots + \frac{\sin((n-1)\pi)}{n}]$  is equal to :

A. 0

B.  $\pi$

C.  $\infty$

D. none of these

**Answer: C**



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26.  $\lim_{n \rightarrow 0} \sum_{r=1}^n \left( \frac{r^3}{r^4 + n^4} \right)$  equals to :

A.  $\log 2$

B.  $\frac{1}{2} \log 2$

C.  $\frac{1}{3} \log 2$

D.  $\frac{1}{4} \log 2$

**Answer: D**



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27. The value of  $\lim_{n \rightarrow \infty} \left\{ \left(1 + \frac{1}{n}\right) \left(1 + \frac{2}{n}\right) \left(1 + \frac{3}{n}\right) \dots (2) \right\}^{1/n}$ , is

A.  $e/4$

B.  $4/e$

C.  $2/e$

D. none of these

**Answer: B**



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28. Evaluate:  $\left( \lim_{n \rightarrow \infty} \right) n \left[ \frac{1}{na} + \frac{1}{na+1} + \frac{1}{na+2} + \dots + \frac{1}{nb} \right]$

A.  $\log\left(\frac{b}{a}\right)$



B.  $\log\left(\frac{a}{b}\right)$

C.  $\log a$

D.  $\log b$

**Answer: A**

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29. If  $I_n = \int_0^{\pi/4} \tan^n x dx$ , ( $n > 1$  is an integer), then (a)  $I_n + I_{n-2} = \frac{1}{n+1}$  (b)  $I_n + I_{n-2} = \frac{1}{n-1}$  (c)  $I_2 + I_4, I_6, \dots$  are in H.P. (d)  $\frac{1}{2(n+1)} < I_n < \frac{1}{2(n-1)}$

A.  $I_n = I_{n-2}$

B.  $I_n + I_{n-2} = \frac{1}{n-1}$

C.  $I_n - I_{n-2} = \frac{1}{n-1}$

D. none of these

**Answer: B**



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30. If  $I_m = \int_1^x (\log x)^m dx$  satisfies the relation  $(I_m) = k - lI_{m-1}$  then

A.  $k=e$

B.  $l=m$

C.  $k = \frac{1}{e}$

D. none of these

Answer: B



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31. If  $I_m = \int_0^\infty e^{-x} x^{n-1} dx$ , then  $\int_0^\infty e^{-\lambda x} x^{n-1} dx$

A.  $\lambda I_n$

B.  $\frac{1}{\lambda} I_n$

C.  $\frac{I_n}{\lambda^n}$

D.  $\lambda^n I_n$

Answer: C

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32. If  $I(m, n) = \int_0^1 x^{m-1}(1-x)^{n-1} dx$ , ( $m, n \in I, m, n \geq 0$ ), then

$$\text{A. } I(m, n) = \int_0^{\infty} \frac{x^{m-1}}{(1+x)^{m+n}} dx = \int_0^{\infty} \frac{x^{n-1}}{(1+x)^{m+n}} dx$$

$$\text{B. } I(m, n) = \int_0^{\infty} \frac{x^m}{(1+x)^{m+n}} dx = \int_0^{\infty} \frac{x^n}{(1+x)^{m+n}} dx$$

$$\text{C. } I(m, n) = \int_0^{\infty} \frac{x^n}{(1+x)^{m+n-1}} dx = \int_0^{\infty} \frac{x^m}{(1+x)^{m+n-1}} dx$$

D. none of these

Answer: A

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33. Find the points of maxima /minima of  $\int_0^{x^2} \frac{t^2 - 5t + 4}{2 + e^t} dt$ .

A.  $x = 0, \pm 1, +1$

B.  $X = \pm 1, \pm 2, \pm 3$

C.  $x = 0, 1, 2, 3$

D. none of these

**Answer: A**



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34. Evaluate the following definite integral:  $\int_{-\pi}^{\pi} \frac{2x(1 + \sin x)}{1 + \cos^2 x} dx$

A.  $\pi^2 / 4$

B.  $\pi^2$

C. 0

D.  $\pi / 2$

**Answer: B**



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35. The value of the integral  $\int_{\alpha}^{\beta} \frac{1}{\sqrt{(x - \alpha)(\beta - x)}} dx$  is

A. 0

B.  $\pi/2$

C.  $\pi$

D. none of these

**Answer: C**



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36. The value of the integral  $\int_{\alpha}^{\beta} \sqrt{(x - \alpha)(\beta - x)} dx$ , is

A.  $\frac{\pi}{4}(\beta - \alpha)^2$

B.  $\frac{\pi}{2}(\beta - \alpha)^2$

C.  $\frac{\pi}{8}(\beta - \alpha)^2$

D. none of these

**Answer: C**



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37. If  $\int_0^{x^2} \sqrt{1+t^2} dt$ , then  $f'(x)$  equals

A.  $\sqrt{1+x^2}$

B.  $\sqrt{1+x^4}$

C.  $2x\sqrt{1+x^4}$

D. none of these

**Answer: C**



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38. The value of integral  $\int_1^e (\log x)^3 dx$ , is

A.  $6 + 2e$

B.  $6 - 2e$

C.  $2e - 6$

D. none of these

**Answer: B**



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39. If  $\int_{x^2}^{x^4} \sin \sqrt{t} dt$ ,  $f'(x)$  equals

A.  $\sin x^2 - \sin x$

B.  $4x^3 \sin x^2 - 2 \sin x$

C.  $x^4 \sin x^2 - x \sin x$

D. none of these

**Answer: B**



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40.  $\lim_{n \rightarrow \infty} \left[ \left(1 + \frac{1}{n}\right) \left(1 + \frac{2}{n}\right) \left(1 + \frac{n}{n}\right) \right]^{\frac{1}{n}}$

A.  $4/e$

B.  $e/4$

C.  $4e$

D. none of these

**Answer: A**



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41.  $\lim_{n \rightarrow \infty} \left[ \left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2^2}{n^2}\right) \dots \left(1 + \frac{n^2}{n^2}\right) \right]^{1/n}$  is equal to :

A.  $\frac{e^{\pi/2}}{2e^2}$



B.  $2e^2e^{\pi/2}$

C.  $\frac{2}{e^2}e^{\pi/2}$

D. none of these

**Answer: C**

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42. If  $\int_0^1 e^{x^2}(x - \alpha)dx = 0$ , then (a)  $\alpha < 2$  (b)  $\alpha < 0$  (c)  $0 < \alpha < 1$  (d)

$\alpha = 0$

A.  $1 < \alpha < 2$

B.  $\alpha < 0$

C.  $0 < \alpha < 1$

D.  $\alpha = 0$

**Answer: C**

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43. If  $f(x)$  satisfies the requirements of Rolle's Theorem in  $[1,2]$  and  $f(x)$  is continuous in  $[1,2]$  then  $\int_1^2 f'(x) dx$  is equal to

A. 0

B. 1

C. 3

D.  $-1$

**Answer: A**



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44. The value of the integral  $\int_0^1 \cot^{-1}(1 - x + x^2) dx$ , is

A.  $\pi - \log 2$

B.  $\frac{\pi}{2} - \log 2$

C.  $\pi + \log 2$

D.  $\frac{\pi}{2} + \log 2$

**Answer: B**

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45. The integral  $\int_{-1}^1 \frac{|x+2|}{x+2} dx$  is equal to

A. 1

B. 2

C. 0

D. -1

**Answer: B**

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46. Let  $I = \int_0^1 \frac{e^x}{x+1} dx$ , then the value of the integral  $\int_0^1 \frac{xe^{x^2}}{x^2+1} dx$ , is

A.  $I^2$

B.  $\frac{1}{2}I$

C.  $2I$

D.  $\frac{1}{2}I^2$

**Answer: B**

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47. Evaluate  $\int_0^\pi \frac{x dx}{1 + \cos \alpha \sin x}$ , where  $0 < \alpha < \pi$ .

A.  $\frac{\pi \alpha}{\sin \alpha}$

B.  $\frac{\pi \alpha}{1 + \sin \alpha}$

C.  $\frac{\pi \alpha}{\cos \alpha}$

D.  $\frac{\pi\alpha}{1 + \cos \alpha}$

**Answer: A**

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48.  $\int_{\pi}^{10\pi} |\sin x| dx$  is equal to

A. 20

B. 8

C. 10

D. 18

**Answer: D**

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49. about to only mathematics

A.  $\frac{\pi a}{(a^2 - b^2)^{3/2}}$

B.  $\frac{\pi b}{(a^2 - b^2)^{3/2}}$

C.  $\frac{\pi}{(a^2 - b^2)^{3/2}}$

D. none of these

**Answer: A**



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50. If  $\int_0^{\infty} e^{-ax} dx = \frac{1}{a}$ , then  $\int_0^{\infty} x^n e^{-ax} dx$  is

A.  $\frac{(-1)^n n!}{a^{n+1}}$

B.  $\frac{(-1)^n (n-1)!}{a^n}$

C.  $\frac{n!}{a^{n+1}}$

D. none of these

**Answer: C**



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51. The value of  $\int_0^{2\pi} [2 \sin x] dx$ , where  $[.]$  represent the greatest integral function, is

A.  $\frac{-5\pi}{3}$

B.  $-\pi$

C.  $\frac{5\pi}{2}$

D.  $-2\pi$

**Answer: A**



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52. If  $f(x) = A \sin\left(\frac{\pi x}{2}\right) + b$ ,  $f'\left(\frac{1}{2}\right) = \sqrt{2}$  and  $\int_0^1 f(x) dx = \frac{2A}{\pi}$

the constants A and B are (a)  $\frac{\pi}{2}$  and  $\frac{\pi}{2}$  (b)  $\frac{2}{\pi}$  and  $\frac{3}{\pi}$  (c) 0 and  $-\frac{4}{\pi}$  (d)

$\frac{4}{\pi}$  and 0

A.  $\frac{\pi}{2}$  and  $\frac{\pi}{2}$

B.  $\frac{2}{\pi}$  and  $\frac{3}{\pi}$

C. 0 and  $-\frac{4}{\pi}$

D.  $\frac{4}{\pi}$  and 0

**Answer: D**



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53. If  $I_{m,n} = \int_0^1 x^m (\ln x)^n dx$  then  $I_{m,n}$  is also equal to

A.  $\frac{n}{n+1} I_{m,n-1}$

B.  $\frac{-m}{n+1} I_{m,n-1}$

C.  $\frac{-n}{m+1} I_{m,n-1}$

D.  $\frac{m}{n+1} I_{m,n-1}$

**Answer: C**



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$$54. \lim_{n \rightarrow \infty} \frac{1^{99} + 2^{99} + 3^{99} + \dots + n^{99}}{n^{100}} =$$

A.  $\frac{99}{100}$

B.  $\frac{1}{100}$

C.  $\frac{1}{99}$

D.  $\frac{1}{101}$

**Answer: B**



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$$55. I_n = \int_0^{\pi/4} \tan^n x dx, \text{ then } \lim_{n \rightarrow \infty} n[I_n + I_{n+2}] \text{ equals :}$$

A. 1

B. 2

C.  $\pi/4$

D.  $\pi$

**Answer: A**



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56. Let  $\int_0^a f(x)dx = \lambda$  and  $\int_0^a f(2a - x)dx = \mu$ . Then  $\int_0^{2a} f(x)dx$  is :

A.  $\lambda + \mu$

B.  $\lambda - \mu$

C.  $2\lambda + \mu$

D.  $\lambda + 2\mu$

**Answer: B**



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