MATHS

BOOKS - BITSAT GUIDE

DEFINITE INTEGRALS AND ITS APPLICATIONS

Practice Exercise

1. $\int_0^{\pi/2} \frac{\tan^2 x}{1+\tan^2 x} dx$ is equal to

A. ∞

B. 0

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

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

Answer: C

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

A. 15

B. 16

C. 10

D. None of these

Answer: B

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3. If $I_{1(n)} = \int_0^{\pi/2} \frac{\sin(2n-1)}{\sin x}dx$ and $I_{2(n)} = \int_0^{\pi/2} \frac{\sin^2 nx}{\sin^2 x}dx, n \in N$, then

A. $I_{2(n+1)} - I_{2(n)} = I_{1(n)}$

B. $I_{2(n+1)} - I_{2(n)} = I_{1(n+1)}$

C. $I_{2(n+1)} + I_{1(n)} = I_{2(n)}$

D. $I_{2(n+1)} + I_{1(n+1)} = I_{2(n)}$

Answer: B

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4. $\int_0^{\pi/4} \left(\sqrt{\tan x} + \sqrt{\cot x}\right) dx$ equals

A. $\sqrt{2}\pi$

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

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

D. 2π

Answer: C

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5. $\int_0^1 \sin\left(2\tan^{-1}\sqrt{\frac{1+x}{1-x}}\right)dx$ is equal to

A. $\pi/6$

B. $\pi/4$

C. $\pi/2$

D. π

Answer: B

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6. $\int_0^{\pi/4} \frac{\sin^2 x.\cos^2 x}{\left(\sin^3 x+\cos^3 x\right)^2}dx$ is equal to

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

B. $\frac{1}{12}$

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

D. $\frac{1}{24}$

Answer: A

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7. The value of $\int_0^{\pi/4} \frac{\sin x + \cos x}{\cos^2 x + \sin^4 x} dx$ is

A. $\frac{1}{2} \frac{\log\left(\left(\sqrt{3}-1\right)\right)}{\sqrt{2}}$

B. $\frac{1}{2\sqrt{3}} \log\left(\frac{\sqrt{3}+1}{\sqrt{2}}\right) + \frac{\pi}{4}$

C. $\frac{1}{2} \log\left(\frac{\sqrt{3}+1}{\sqrt{2}}\right) + \frac{\pi}{4}$

D. $\frac{1}{\sqrt{3}} \log\left(\frac{\sqrt{3}+1}{\sqrt{2}}\right) + \frac{\pi}{4}$

Answer: D

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8. The value of $\int_0^{2\pi} e^x \sin\left(\frac{\pi}{4}+\frac{x}{2}\right)dx$ is

A. $\frac{\sqrt{2}}{5}\left(e^{2\pi}+1\right)$

B. $-\frac{\sqrt{2}}{5}\left(e^{2\pi}+1\right)$

C. $\frac{-\sqrt{2}}{5}\left(e^{2\pi}-1\right)$

D. $\frac{\sqrt{2}}{5}\left(e^{2\pi}-1\right)$

Answer: B

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9. If $\phi'(x)=\frac{\log\sin x}{x}, x\neq n\pi, n\in I$ and $\int_1^3 \frac{3\log\left(\sin x^3\right)}{x}dx=\phi(k)-\phi(1)$, then the possible values of k is

A. 27

B. 18

C. 9

D. 36

Answer: A

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10. The value of $\int_3^5 e^{f[\phi(x)]}.\, f'[\phi(x)] \quad \phi'(x)dx$, where $\phi(3) = \phi(5)$, is

A. 1

B. 0

C. 3

D. 4

Answer: B

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11. $\int_0^{\pi/2} \frac{dx}{\sin\left(x - \frac{\pi}{3}\right)\sin\left(x - \frac{\pi}{6}\right)}$ is equal to

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

B. $-4\log\sqrt{3}$

C. $2\log\sqrt{3}$

D. $-2\log\sqrt{3}$

Answer: B

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12. $\int_{-2}^{2}\frac{dx}{1+|x-1|}$ is equal to

A. log2

B. 2 log2

C. 3 log2

D. 4 log2

Answer: C

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13. 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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14. The integral $\int_0^{1.5} [x^2]dx$, where $[x^2]$ denotes the greatest integer less than or equal to x, is equal to

A. $2+\sqrt{2}$

B. $2-\sqrt{2}$

C. 1.5

D. None

Answer: B

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15. Let a, b and c be non - zero real numbers such that $\int_0^3 (3ax^2 + 2bx + c)dx = \int_1^3 (3ax^2 + 2bx + c)dx$, then

A. $a + b + c = 3$

B. $a + b + c = 1$

C. $a + b + c = 0$

D. $a + b + c = 2$

Answer: C

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16. 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. $\int_0^n f(x)dx$

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

Answer: C

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17. If $\int_{-2}^{x} |2t|dt = f(x),$ then for any $x \geq 0$, $f(x)$ is equal to

A. $4 + x^2$

B. $4 - x^2$

C. $\frac{1}{2}(4 + x^2)$

D. $\frac{1}{4}(4 - x^2)$

Answer: A

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18. The correct evaluation of $\int_0^{\pi/2} \left|\sin\left(x - \frac{\pi}{4}\right)\right| dx$ is

A. $2 + \sqrt{2}$

B. $2 - \sqrt{2}$

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

D. 0

Answer: B

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19. $\int_{\pi/2}^{\pi/2} \frac{\cos x}{1 + e^x} dx$ is equal to

A. 1

B. 0

C. -1

D. None

Answer: A

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20. The value of $\int_{7\pi/4}^{7\pi/3} \sqrt{\tan^2 x} dx$ is

A. $\log 2\sqrt{2}$

B. $\log 2$

C. $2\log 2$

D. $\log \sqrt{2}$

Answer: A

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21. The value of $\int_1^3 |(x-1)(x-2)(x-3)|dx$ is

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

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

C. $\frac{9}{4}$

D. $\frac{9}{5}$

Answer: B

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22. $\int_0^1 |\sin 2\pi x|dxisequa < o\frac{1}{3}$ (b) $\frac{1}{2}$ (c) 0 (d) $\frac{2}{\pi}$

A. 0

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

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

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

Answer: D

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23. The value of $\int_0^{\pi/2} \frac{\psi(x)}{\psi(x)+\psi\left(\frac{\pi}{2}-x\right)}dx$ is

A. $\pi/4$

B. $\pi/2$

C. π

D. None

Answer: A

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24. Evaluate: $\int_0^1 \cot^{-1}\left(1-x+x^2\right)dx$

A. $\pi - \log 2$

B. $\pi/2 - \log 2$

C. $\pi + \log 2$

D. $\pi/2 + \log 2$

Answer: B

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

A. π

B. $a\pi$

C. $\pi/2$

D. 2π

Answer: C

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

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

B. $\frac{a}{2}\int_0^a f(x)dx$

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

D. $a\int_0^a f(x)dx$

Answer: B

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27. The value of $\int_0^{\pi} e^{\cos^2 x}\cos^5 3x dx$ is

A. 1

B. -1

C. 0

D. None

Answer: C

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28. The value of $\int_0^{\pi} \frac{\sin 2kx}{\sin x} dx, \quad \text{where} \quad k \in I$, is

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

B. π

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

D. 0

Answer: D

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29. $\int_{-1/2}^{1/2} (\cos x) \left[\log\left(\frac{1-x}{1+x}\right)\right] dx$ is equal to

A. 0

B. 1

C. $\hat{}\ (1/2)$

D. $2e^{1/2}$

Answer: A

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30. Evaluate the following: $\int_{-1}^{1} \frac{\sin x - x^2}{3 - |x|} dx$

A. 0

B. $\frac{\int_0^{\sin x}}{3 - |x|} dx$

C. $2\int_0^1 \frac{-x^2}{3 - |x|} dx$

D. $2\int_0^1 \frac{\sin x - x^2}{3 - |x|} dx$

Answer: C

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31. $\int_{-1}^{1} \frac{x^3 + |x| + 1}{x^2 + 2|x| + 1} dx$ is equal to

A. In 2

B. 2 In 2

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

D. 4 In 2

Answer: B

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32. $\int_{-\pi/2}^{\pi/2} \sin^{10} x \left(6x^9 - 25x^7 + 4x^3 - 2x\right) dx$ is equal to

A. π

B. 0

C. 25

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

Answer: B

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33. If f and g are two continuous function, then the value of $\int_{-\pi/4}^{\pi/4}\{f(x)+f(-x)\}\{g(x)-g(-x)\}dx$ is

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

B. 0

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

D. π

Answer: B

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34. If $P = \int_0^{3\pi} f(\cos^2 x)\,dx$ and $Q = \int_0^{\pi} f(\cos^2 x)\,dx$ then

A. $P - Q = 0$

B. $P - 2Q = 0$

C. $P - 3Q = 0$

D. $P - 5Q = 0$

Answer: C

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35. $If f(2-x) = f(2+x) and f(4-x) = f(4+x)$ for all $x and f(x)$ is a function for which $\int_0^2 f(x)dx = 5, then \int_0^{50} f(x)dx$ is equal to 125 (b) $\int_{-4}^{46} f(x)dx \int_1^{51} f(x)dx$ (d) $\int_2^{52} f(x)dx$

A. 125

B. $\int_{-4}^{46} f(x)dx$

C. $\int_1^{51} f(x)dx$

D. $\int_2^{52} f(x)dx$

Answer: A

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36. If $l_1 = \int_1^2 \frac{dx}{\sqrt{1+x^2}}$ and $I_2 = \int_1^2 \frac{dx}{x}$, then

A. $l_1 > l_2$

B. $l_2 > l_1$

C. $l_1 = l_2$

D. $l_1 > 2l_2$

Answer: B

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37. 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

Answer: C

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38. Let $f(x) = \int_1^x \sqrt{2 - t^2}\,dt$. Then the real roots of the equation $x^2 - f'(x) = 0$ are

A. ± 1

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

C. $\pm 1/2$

D. 0 and 1

Answer: A

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39. If F(x) $= \frac{1}{x^2}\int_4^x \left[4t^2 - 2F'(t)\right]dt$ then F'(4) equals

A. 32

B. $\frac{32}{3}$

C. $\frac{32}{9}$

D. None

Answer: C

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40. If $f(x)$ is differentiable and $\int_0^{t^2} xf(x)dx = \frac{2}{5}t^5$, then $f\left(\frac{4}{25}\right)$ equals $\frac{2}{5}$ (b) $-\frac{5}{2}$ 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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41. $\lim_{n \to \infty} \frac{(r)^{1/n}}{n}$ equals

A. e

B. e^{-1}

C. 1

D. None

Answer: B

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42. The value of $\lim_{n\to\infty}\left(\frac{n}{(n+1)\sqrt{2n+1}}+\frac{n}{(n+2)\sqrt{2(2n+2)}}+\frac{n}{(n+3)\sqrt{3}(2n+3)}\right.$ is

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

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

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

D. None of these

Answer: A

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43. $\lim_{n\to\infty}\left\{\frac{1}{n+1}+\frac{1}{n+2}+\frac{1}{n+3}+\ldots+\frac{1}{n+n}\right\}$ is, equal to

A. 3 log 2

B. log 2

C. 2 log 2

D. 4 log 2

Answer: B

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44. $\lim_{n\to\infty}\left[\frac{1}{n}+\frac{n^2}{(n+1)^3}+\frac{n^2}{(n+2)^3}+\ldots+\frac{1}{8n}\right]$ is equal to

A. $\frac{3}{8}$

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

C. $\frac{1}{8}$

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

Answer: A

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45. Find the limit, when $n \to \infty$, of

$$\frac{\sqrt{n}}{\left(3+4\sqrt{n}\right)^2}+\frac{\sqrt{n}}{\sqrt{2}\left(3\sqrt{2}+4\sqrt{n}\right)^2}$$
$$\frac{\sqrt{n}}{\sqrt{3}\left(3\sqrt{3}+4\sqrt{n}\right)^2}+\ldots+\frac{1}{49n}$$

A. 1

B. $\frac{1}{14}$

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

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

Answer: B

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46. The area of the region lying between the line $x - y + 2 = 0$ and the curve $x = \sqrt{y}$, is

A. 9

B. $\frac{9}{2}$

C. $\frac{10}{3}$

D. None

Answer: C

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47. Area bounded by the curves $y = x \sin x$ and x-axis between $x = 0$ and $x = 2\pi$ is

A. 2π

B. 3π

C. 4π

D. None

Answer: C

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48. The area bounded by the parabola $y^2 = x$, straight line $y = 4$ and Y-axis, is

A. $\frac{16}{3}$ sq units

B. $\frac{64}{3}$ sq units

C. $7\sqrt{2}$ sq units

D. None of these

Answer: B

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49. The area enclosed between the curves $y = x^3$ and $y = \sqrt{x}$ is

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

B. $\frac{5}{4}$ sq units

C. $\frac{5}{12}$ sq units

D. $\frac{12}{5}$ sq units

Answer: C

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50. The area of the smaller segment cut off from the circle $x^2 + y^2 = 9$ by x = 1 is

A. $\frac{1}{2}\left(9\sec^{-1}3 - \sqrt{x}\right)$

B. $\sec^{-1}3 - \sqrt{8}$

C. $\sqrt{8} - 9\sec^{-1}3$

D. None of these

Answer: B

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51. Sketch the graph of $y = |x + 3|$ and evaluate $\int -60|x + 3|dx$.

A. 9 sq units

B. $\frac{9}{2}$ sq units

C. 3 sq units

D. 11 sq units

Answer: A

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52. If $y = f(x)$ makes positive intercepts of 2 and 1 unit on x and y-coordinates axes and encloses an area of $\frac{3}{4}$ sq unit with the axes, then $\int_0^2 xf'(x)dx$ equals

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

B. 1

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

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

Answer: D

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53. The area in the first quadrant between $x^2 + y^2 = \pi^2$ and $y = \sin x$, is

A. $\frac{\pi^3 - 8}{4}$

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

C. $\frac{\pi^3 - 16}{4}$

D. $\frac{\pi^3 - 8}{2}$

Answer: A

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54. Find the area of the region $\{(x, y) : x^2 + y^2 \leq 1 \leq x + y\}$

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

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

C. $\frac{\pi^2}{3}$

D. $\frac{\pi}{4} - \frac{1}{2}$

Answer: D

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55. The area bounded by the curve y = In (x) and the lines $y = 0, y = In(3)$ and $x = 0$, is equal to

A. 3

B. 3 In (3) -2

C. $3In(3) + 2$

D. 2

Answer: D

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56. The area under the curve $y = |\cos x - \sin x|, 0 \leq x \leq \frac{\pi}{2}$, and above x-axis is: (A) $2\sqrt{2} + 2$ (B) 0 (C) $2\sqrt{2} - 2$ (D) $2\sqrt{2}$

A. $2\sqrt{2}$

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

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

D. 0

Answer: B

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57. The area (in sqaure units) of the region enclosed by the curves $y = x, x = 2, y = \frac{1}{x}$ and the positive x-axis is

A. 1 sq units

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

C. $\frac{5}{2}$ sq units

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

Answer: B

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58. The area bounded by the curves y = cos x and y = sin x between the ordinates x = 0 and $x = \frac{3\pi}{2}$, is

A. $\left(4\sqrt{2} - 2\right)$ sq units

B. $\left(4\sqrt{2} + 2\right)$ sq units

C. $\left(4\sqrt{2} - 1\right)$ sq units

D. $\left(4\sqrt{2}+1\right)$ sq units

Answer: A

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59. Find the area of the region bounded by the curve $y^2 = 4x$ and $x^2 = 4y$.

A. 0

B. $\frac{32}{3}$ sq units

C. $\frac{16}{3}$ sq units

D. $\frac{8}{3}$ sq units

Answer: C

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60. The area bounded by $y = xe^{|x|}$ and the lines $|x| = 1, y = 0$ is

A. 1 sq units

B. 2 sq units

C. 3 sq units

D. None of these

Answer: B

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61. The area bounded by the curves $y^2 = x^3$ and $|y| = 2x$ is

A. $\frac{5}{16}$ sq units

B. $\frac{16}{5}$ sq units

C. $\frac{3}{8}$ sq units

D. None of these

Answer: D

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62. The area bounded by the curve $y = x|x|$, x-axis and the ordinates x=1,x=-1 is given by

A. 0

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

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

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

Answer: C

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1. The value of $x > 1$ satisfying the equation $\int_1^x t \ln t dt = \frac{1}{4}$ is

A. $\sqrt{e}$

B. $e^{3/2}$

C. e^2

D. $2e - 1$

Answer: A

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2. If $\int_0^{25} e^{x - [x]} dx = k(e - 1)$, then the value of k is equal to

A. 12

B. 25

C. 23

D. 24

Answer: B

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3. The area bounded by the curves $y = -\sqrt{-x}$ and $x = -\sqrt{-y}$, where $x, y \geq 0$, is

A. $1/3$

B. $1/4$

C. $1/5$

D. $1/2$

Answer: A

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4. $\int_1^{10\pi} \left(\left[\sec^{-1} x\right] + \left[\cot^{-1} x\right]\right) dx$, where [.] denotes the greatest integer function, is equal to:

A. $10\pi - \tan^{-1} x$

B. $8\pi - \sec 1$

C. $10\pi - \sec 1$

D. $10\pi + \sec 1$

Answer: C

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5. Determine the area of the figure bounded by two branches of the curve $(y - x)^2 = x^3$ and the straight line $x = 1$.

A. $\frac{4}{5}$ sq units

B. $\frac{4}{7}$ sq units

C. $\frac{4}{9}$ sq units

D. $\frac{4}{11}$ sq units

Answer: A

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6. $\int_0^{\pi/2} \frac{\sin^n \theta}{\sin^n \theta + \cos^n \theta} dth\eta$ is equal to

A. 1

B. 0

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

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

Answer: D

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7. $\int_0^{\pi} \cos^{101} x dx$ is equal to

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

B. $\frac{1}{102}$

C. $\left(\frac{\pi}{3}\right)^{101}$

D. 0

Answer: D

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8. $\lim_{n \to \infty} \left[\frac{1}{n+1} + \frac{1}{n+1} + \ldots + \frac{1}{6n}\right]$ equals

A. log2

B. $\log\left(1+\sqrt{5}\right)$

C. log 6

D. 0

Answer: C

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9. If $\frac{d}{dx}\{\phi(x)\} = f(x), \quad \text{then} \quad \int_1^2 f(x)dx$ is equal to

A. $f(1) - f(2)$

B. $\phi(1) - \phi(2)$

C. $f(2) - f(1)$

D. $\phi(2) - \phi(1)$

Answer: D

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10. $\int_0^2 |1 - x|dx$ is equal to

A. 0

B. 1

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

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

Answer: B

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11. The area bouded by X-axis and the curve y -= sinx and x = 0, $x = \pi$ is

A. 1 sq unit

B. 2 sq unit

C. 0

D. 4 sq unit

Answer: B

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12. $\int_0^1 |5x - 3| dx$

A. $\frac{10}{13}$

B. $\frac{31}{10}$

C. $\frac{13}{10}$

D. None of these

Answer: C

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13. The area of the region bounded by $y = |x - 1|$ and y =1 is

A. 1

B. 2

C. $1/2$

D. None

Answer: A

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14. $\int_{-1}^{2} |x|^3 dx$ is equal to

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

B. $\frac{17}{4}$

C. $\frac{15}{4}$

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

Answer: B

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15. $\int_{-\pi/2}^{\pi/2} \sin|x| dx$ is equal to

A. 0

B. 1

C. 2

D. π

Answer: C

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16. The area (in sq units) of the region bounded by the curve $2x = y^2 - 1$ and $x = 0$ is

A. $1/3$

B. $2/3$

C. 1

D. 2

Answer: B

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17. $\int_0^8 |x-5|dx$ is equal to

A. 17

B. 9

C. 12

D. 18

Answer: A

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18. If $l_1 = \int_0^{12} \hat{} \, xdx, l_2 = \int_0^{12} \hat{} \, (x^3)dx, , l_3 = \int_1^{22} \hat{} \, (x^2)dx, l_4 = \int_1^{22} \hat{} \, (x$, then

A. $l_3 > l_4$

B. $l_3 = l_4$

C. $l_1 > l_2$

D. $l_2 > l_1$

Answer: C

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19. The area of the region satisfying $x \leq 2, y \leq |x|$ and $x \geq 0$ is

A. 4 sq units

B. 1 sq units

C. 2 sq units

D. None

Answer: C

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20. $\int_0^{\pi/4} \log(1 + \tan x) dx$ is equal to

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

B. $\frac{\pi}{4}\log_2 e$

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

D. $\frac{\pi}{8}\log_e\left(\frac{1}{2}\right)$

Answer: A

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21. The area bounded by the parabola $y^2 = 4ax$ and the lines x = a and x = 4a, is

A. $\frac{35a^2}{3}$

B. $\frac{4a^2}{3}$

C. $\frac{7a^2}{3}$

D. $\frac{56a^2}{3}$

Answer: D

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22. If $\int_{\log 2}^{x} \frac{du}{(e^u - 1)^{1/2}} = \frac{\pi}{6}$, then e^x is equal to

A. 1

B. 2

C. 4

D. -1

Answer: C

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23. $\int_0^{2n\pi} \left\{ |\sin x| - \left| \frac{1}{2} \sin x \right| \right\} dx =$ (A) n (B) $2n$ (C) $-2n$ (D) $\frac{1}{2}$

A. n

B. 2n

C. $-2n$

D. None

Answer: B

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24. The value of $\left[\int_0^{\sin^2\theta} \sin^{-1}\sqrt{\phi}d\phi + \int_0^{\cos^2\theta} \cos^{-1}\sqrt{\phi}d\phi\right]$ is

A. π

B. $\pi/2$

C. $\pi/3$

D. $\pi/4$

Answer: D

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25. The area bounded by the curves $y = x^2$ and $y = 2 - x^2$ is

A. $\frac{8}{3}$ sq units

B. $3/8$ sq units

C. $3\frac{/}{2}$ sq units

D. None of these

Answer: A

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