# MATHS

## BOOKS - MCGROW HILL EDUCATION MATHS (HINGLISH)

## DEFINITE INTEGRALS

### Illustration

1. $\lim_{n \to \infty} \left[ \frac{1}{n^2} + \frac{2}{n^2} + \ldots + \frac{n}{n^2} \right]$

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

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**3.** Evaluate $\int_0^2 \left(\frac{x^2}{4} - 7x + 5\right) dx$

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**4.** Find the average value of $f(x) = 4 - x^2$ on [0,3]

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**5.** Find the value of $\int_0^1 \left\{\left(\sin^{-1} x\right)/x\right\} dx$

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## Solved Examples Concept Based Single Correct Answer Type Questions

**1.** The value of $\int_0^1 \frac{x dx}{(x^2+1)^2}$ is

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

B. $1$

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

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

**Answer: D**

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2. $\int_{1/\pi}^{2/\pi} \frac{\sin(1/x)}{x^2} dx = ?$

A. $1$

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

C. $-1$

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

**Answer: A**

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3. $\int \frac{\sqrt{e^x}}{\sqrt{e^{-1}-e^x}}dx =$

A. $e^2+1$

B. $\sqrt{e^2+1}$

C. $e^2$

D. $e^2-1$

**Answer: B**

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4. If $\int_{\log 2}^{x} \frac{1}{\sqrt{e^x-1}}dx = \frac{\pi}{6}$ then x is equal to

A. $\log 2$

B. $3\log 2$

C. $2\log 2$

D. 2

**Answer: C**

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**5.** The value of $\int_{-\frac{\pi}{8}}^{\frac{\pi}{8}} x^{10} \sin^9 x dx$ is equal to

A. $0$

B. $1$

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

D. $\left(\frac{\pi}{8}\right)^{10}$

**Answer: A**

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**6.** $\int_0^{\pi/2} \max(\sin x \cos x) dx$ is equal to

A. $1$

B. $2$

C. $2-\sqrt{2}$

D. $\sqrt{2}$

**Answer: D**

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**7.** If $\int_0^{\pi/2} \frac{\cos x dx}{6-5\sin x+\sin^2 x} = \log K$ then $K$ is equal to

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

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

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

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

**Answer: B**

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8. $\int_{-1}^{1} x|x|dx$ is equal to

A. 1

B. 0

C. 2

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

**Answer: A**

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9. The value of $\lim_{n \to \infty} \left( \frac{1}{\sqrt{4n^2 - 1}} + \frac{1}{\sqrt{4n^2 - 4}} + \ldots + \frac{1}{\sqrt{4n^2 - n^2}} \right)$ is -

A. $\pi$

B. $\pi / 6$

C. $\pi / 3$

D. $\pi/4$

**Answer: B**

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**10.** $\int_0^{10\pi} \sqrt{1-\sin^2 x}dx$ is equal to

A. $0$

B. $10$

C. $10\pi$

D. $20$

**Answer: A**

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## Solved Examples Level 1 Single Correct Answer Type Questions

1. $\int_0^{\frac{\pi}{2}} \frac{dx}{1+\cot x}$

A. $\pi$

B. $\pi/2$

C. $\pi/4$

D. $\pi/3$

**Answer: C**

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2. The value of $I = \int_0^{\pi} \frac{x dx}{4\cos^2 x + 9\sin^2 x}$ is

A. $\pi^2/12$

B. $\pi^2/4$

C. $\pi^2/6$

D. $\pi^2/3$

**Answer: A**

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**3.** If $\int_e^x tf(t)dt = \sin x - x\cos x - \frac{x^2}{2}$ 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. $-1/2$

D. $3/2$

**Answer: C**

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**4.** The value of $\int_0^2 x^{[x^2+1]}\,dx$, where $[x]$ is the greatest integer less than or equal to $x$ is

A. $2$

B. $8/3$

C. $4$

D. none of these

**Answer: D**

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**5.** 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. $\pm\frac{1}{\sqrt{2}}$ c.$\pm\frac{1}{2}$ d. 0&1

A. $\pm 1$

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

C. $\pm 1/2$

D. $0$ and $1$

**Answer: A**

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**6.** The integral $\int_{-\frac{1}{2}}^{\frac{1}{2}} \left( [x] + \log\left( \frac{1+x}{1-x} \right) \right) . dx$ equals

A. $-1/2$

B. $0$

C. $1$

D. $2\log(1/2)$

**Answer: A**

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**7.** The value $I = \int_{-1}^{1} \left( \cos^{-1} x + \frac{x^7 - 3x^5 + 7x^3 - x}{\cos^2 x} \right) dx$ is

A. $\pi/2$

B. $0$

C. $2\pi$

D. $\pi$

**Answer: D**

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**8.** The value of $I = \int_{-\pi/2}^{\pi/2} \sqrt{\cos x - \cos^3 x} \quad dx$is

A. $0$

B. $2/3$

C. $4/3$

D. $1/3$

**Answer: C**

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**9.** If $n \in N$, the value of $\int_0^n [x]dx$ (where [x] is the greatest integer function) is

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

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

C. $n(n-1)$

D. none of these

**Answer: B**

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**10.** If $F(x) = \int_3^x \left(2 + \frac{d}{dt}\cos t\right)dt$ then $F'\left(\frac{\pi}{6}\right)$ is equal to

A. $1/2$

B. $2$

C. $3/4$

D. $3/2$

**Answer: D**

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**11.** The value of $\lim_{n \to \infty} \frac{1}{n} \cdot \sum_{r=1}^{2n} \frac{r}{\sqrt{n^2 + r^2}}$ 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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**12.** The value of the integral $\int_0^{n\pi+1} (|\cos x| + |\sin x|)dx$ is

A. $n$

B. $2n + \sin t + \cos t$

C. $\cos t$

D. $\sin t - \cos t + 4n + 1$

**Answer: D**

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**13.** $If g(x) = \int_0^x \cos 4t dt$, then $g(x + \pi)$ equals

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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**14.** The value of $\int_0^{\pi/2} \frac{dx}{1+\tan^3 x}$ is

A. $0$

B. $1$

C. $\pi/4$

D. $\pi/2$

**Answer: C**

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**15.** The value of $\int_0^4 3^{\sqrt{2x+1}} dx$ is

A. $\frac{6}{\log 3}\left(13 - \frac{4}{\log 3}\right)$

B. $\frac{66}{\log 3}$

C. $\frac{6}{\log 3}\left(13-\frac{5}{\log 3}\right)$

D. none of these

**Answer: D**

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16. $\int_0^1 x(1-x)^{99}dx =$

A. $\frac{1}{10100}$

B. $\frac{11}{10100}$

C. $\frac{1}{10010}$

D. none of these

**Answer: A**

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**17.** The value of $\sum_{n=1}^{1000} \int_{n-1}^{n} e^{x-[x]}\,dx$, where $[x]$ is the greatest integer function, is (A) $\frac{e^{1000}-1}{1000}$ (B) $\frac{e-1}{1000}$ (C) $\frac{e^{1000}-1}{e-1}$ (D) $1000(e-1)$

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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**18.** Let $f: R \to R$ and $g: R \to R$ be continuous functions. Then the value of the integral $\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} [f(x)+f(-x)][g(x)-g(-x)]dx$ is

A. 1

B. 0

C. $-1$

D. $\pi$

**Answer: B**

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**19.** If $f(x) = (1 + \tan x)(1 + \tan(\pi/4 - x))$ and $g(x)$ is a function with domain R, then $\int_0^1 x^3 \mathrm{g\,o} f(x) dx$ is

A. $\frac{1}{2} g(\pi/4)$

B. $\frac{1}{4} g(2)$

C. $\frac{1}{4} g(1)$

D. none of these

**Answer: B**

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**20.** Find $\lim_{n \to \infty} S_n$ ; if $S_n = \frac{1}{2n} + \frac{1}{\sqrt{4n^2 - 1}} + \frac{1}{\sqrt{4n^2 - 4}} + \ldots\ldots + \frac{1}{\sqrt{3n^2 + 2n - 1}}.$

A. $\pi / 2$

B. $2$

C. $1$

D. $\pi / 6$

**Answer: D**

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**21.** Evaluate: $\int_{-\pi}^{3\pi} \log(sec\theta - tan\theta) dth\eta$

A. $1$

B. $0$

C. $2$

D. none of these

**Answer: B**

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**22.** The value of $\int_0^\infty \frac{dx}{(x^2+4)(x^2+9)}$ is

A. $1/60$

B. $1/80$

C. $1/40$

D. $1/20$

**Answer: A**

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**23.** Evaluate $\int -1\frac{3}{2}|x\sin(\pi x)|dx$

A. $3\pi+1$

B. $2\pi + 1$

C. $1$

D. $4$

**Answer: A**

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**24.** If $f(0) = 2, f'(x) = f(x), \phi(x) = x + f(x)$ then $\int_0^1 f(x)\phi(x)dx$ is

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**25.** Evaluate: $(\lim)_{x \to 2} \frac{\int 0 x \cos t^2 dt}{x}$

A. $1$

B. $0$

C. $-1$

D. $2$

**Answer: A**

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**26.** If $f(x) = \int_{1/x^2}^{x^2} \cos\sqrt{t}dt$, then $f'(1)$ is equal to

A. $\cos 1$

B. $2\cos 1$

C. $4\cos 1$

D. none of these

**Answer: C**

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**27.** The least value of the function

$$\phi(x) = \int_{5\pi/4}^{x} (3\sin t + 4\cos t)dt$$

on the integral $[5\pi/4, 4\pi/3]$, is

A. $3/2 - \sqrt{3}/2$

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

C. $\dfrac{7 - 4\sqrt{3}}{2}$

D. $\dfrac{9 - 4\sqrt{3}}{2}$

**Answer: D**

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**28.** Evaluate $\int_0^a \left(\dfrac{\log(1+ax)}{1+x^2}dx\right)$

A. $a(\log 2)\dfrac{\pi}{2}$

B. $\dfrac{1}{a}(\log 2)\dfrac{\pi}{2}$

C. $\frac{1}{a}(\log 2)\frac{\pi}{8}$

D. $\frac{1}{a^2}(\log 2)$

**Answer: C**

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**29.** If $I_{m,n} = \int_0^1 x^m (\ln x)^n dx$ then $I_{m,n}$ is also equal to

A. $-\frac{5!}{6^5}$

B. $-\frac{5!}{5^5}$

C. $-\frac{5!}{6^6}$

D. $\frac{5!}{6^6}$

**Answer: C**

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**30.** If $I_n = \int_0^1 \left(\cos^{-1} x\right)^n dx$ then $I_6 - 360I_2$ is given by

A. $6(\pi/2)^5$

B. $6(\pi/2)^5 - 120(\pi/2)^3$

C. $6(\pi/2)^5$

D. $6(\pi/2)^5 - 4(\pi/2)^3$

**Answer: B**

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**31.** If $I_n = \int_0^{\pi/2} x^n \sin x dx$, then $I_4 + 12I_2$ is equal to

A. $(\pi/2)^6$

B. $(\pi/2)^8$

C. $(\pi/2)^6 - 1$

D. $(\pi/2)^8 - 1$

**Answer: B**

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**32.** If a function $f:[0,27]\to R$ is differentiable then for some $0<\alpha<\beta<3$, $\int_0^{27} f(x)dx$ is equal to

A. $3\left[\alpha^2 f\left(\alpha^3\right)+\beta^2 f\left(\beta^3\right)\right]$

B. $3\left[\alpha^2 f(\alpha)+\beta^2 f(\beta)\right]$

C. $3\left[\alpha^2 f\left(\alpha^3\right)+\frac{1}{2}\beta^2 f\left(\beta^3\right)\right]$

D. $3\left[\alpha^2 f(\alpha)+\frac{1}{2}\beta^2 f(\beta)\right]$

**Answer: C**

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**33.** The difference between the greatest and least values of $f(x)=\int_0^x (t+1)dt$ on $[2,3]$ is

A. 3

B. 2

C. $7/2$

D. $3/2$

**Answer: C**

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**34.** The value of the integral $\int_0^{\pi/4} \frac{\sin x + \cos x}{3 + \sin 2x} dx$,is

A. $\log 2$

B. $\log 3$

C. $(1/4)\log 3$

D. $(1/8)\log 3$

**Answer: C**

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**35.** Find the points of minima for $f(x) = \int_0^x t(t-1)(t-2)dt$

A. $x = -1$

B. $x = 3/2$

C. $x = 4/3$

D. $x = 1$

**Answer: C**

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**36.** The value of the integral $\int (0)^{\pi/2} \frac{dx}{1 + \frac{1}{6}\sin^2 x}$ is

A. $\frac{\pi}{2}\sqrt{\frac{6}{7}}$

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

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

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

**Answer: A**

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**37.** $\int_{e^{-1}}^{e^2} \left| \frac{\ln x}{x} \right| dx$

A. $3/2$

B. $5/2$

C. $3$

D. $5$

**Answer: B**

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38. If $f(x) = \begin{cases} e^{\cos x \sin x}, f \text{ or } |x| \leq 2 \\ 2, otherwise, then \end{cases} \int_{-2}^{3} f(x)dx =$ 0

(b) 1 (c) 2 (d) 3

A. $0$

B. $1$

C. $2$

D. $3$

**Answer: C**

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39. $\int_{\pi/4}^{3\pi/4} \frac{dx}{1+\cos x} =$

A. $2$

B. $-2$

C. $1/2$

D. $-1/2$

**Answer: A**

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**40.** $\int_0^{\pi^2/4} \sin\sqrt{x}dx$ equals to

A. $0$

B. $1$

C. $2$

D. none of these

**Answer: C**

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**41.** The value of the integral $\int_0^{100\pi} \sqrt{1-\cos 2x}\ \mathrm{d}x$ is

A. $100\sqrt{2}$

B. $2000\sqrt{2}$

C. $0$

D. $100\pi$

**Answer: B**

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**42.** The value of $\int_a^b \frac{|x|}{x}\,dx,\ a<b$ is

A. $b-a$

B. $a-b$

C. $|b|-|a|$

D. $|b|+|a|$

**Answer: C**

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**43.** Let $f$ be an odd function then $\int_{-1}^{1}(|x|+f(x)\cos x)dx$ is equal to

A. $0$

B. $1$

C. $2$

D. none of these

**Answer: B**

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**44.** Let f be a periodic continuous function with period $T>0$. If $I=\int_{0}^{T}f(x)dx$ Then the value of $I_1=\int_{4}^{4+4T}f(3x)dx$ is

A. $I$

B. $2I$

C. $3I$

D. $4I$

**Answer: D**

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**45.** Let $f(x) = \int_0^x \sqrt{6 - \mu^2} du$. Then the real roots of the equation $x^2 - f'(x) = 0$ are

A. $x = \pm\sqrt{6}$

B. $x = \pm\sqrt{3}$

C. $x = \pm\sqrt{2}$

D. $x = \pm 1$

**Answer: C**

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**46.** If $f(x) = \int_{x^2}^{x^2+4} e^{-t^2} dt$, then the function $f(x)$ increases in

A. $(-\infty, 0)$

B. $(0, \infty)$

C. $(-1, 2)$

D. $(-2, \infty)$

**Answer: A**

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**47.** If $\int_{\sin x}^{1} t^2 f(t) dt = 1 - \sin x$, then the value of $f\left(\frac{1}{\sqrt{3}}\right)$ is (A) $\frac{1}{\sqrt{3}}$ (B) $\frac{1}{3}$ (C) $\sqrt{3}$ (D) 3

A. $1/3$

B. $1/\sqrt{3}$

C. $\sqrt{3}$

D. $3$

**Answer: D**

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**48.** The integral $I = \int_{-3/2}^{3/2} \left([x] + x^3 + \log_a\left(x + \sqrt{x^2+1}\right)\right) dx$ is equal

A. $0$

B. $-3/2$

C. $1$

D. $3/2$

**Answer: B**

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**49.** The value of $\int_0^{\pi/4} \log(1+\tan\theta)d\theta$ is equal to

A. $\pi \log 2$

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

C. $(\pi \log 2)/4$

D. $\log 2$

**Answer: C**

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**50.** $\int_a^b \sqrt{(x-a)(b-x)}dx, (b>a)$ is equal to

A. $\pi(b-a)^2/8$

B. $\pi(b+a)^2/8$

C. $\pi(b-a)^2$

D. $\pi(b+a)^2$

**Answer: A**

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**51.** $\lim_{n\to\infty}\left(\frac{1}{n}+\frac{1}{n+1}+\ldots+\frac{1}{3n}\right)$ is equal to

A. $\log 2$

B. $lgo3$

C. $\log 5$

D. $0$

**Answer: B**

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**52.** Let $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $I = \int_0^1 \frac{\cos x}{\sqrt{x}} \int dx.$

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

A. $-1$

B. $-\pi/2$

C. $\pi/2$

D. $1$

**Answer: B**

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

Then $\int_0^1 p(x)dx$ is equal to

A. $41$

B. $42$

C. $\sqrt{41}$

D. $21$

**Answer: D**

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**55.** The value of $\int \frac{8\log(1+x)}{1+x^2}dx$ is

A. $\log 2$

B. $\pi \log^2$

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

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

**Answer: B**

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**56.** For $x\varepsilon\left(0, \frac{5\pi}{2}\right)$, definite $f(x) = \int_0^x \sqrt{t}\sin t dt$. Then $f$ has

A. local maximum at $\pi$ and local minimum at $2\pi$

B. local maximum at $\pi$ and $2\pi$

C. local minimum at $\pi$ and $2\pi$

D. local minimum at $\pi$ local maximum at $2\pi$

**Answer: A**

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**57.** Let [.]denote the greatest integer function, then the value of $\int_5^{15} x\left[x^2\right]dx$, is

A. $0$

B. $3/2$

C. $3/4$

D. $5/4$

**Answer: C**

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**58.** $If g(x) = \int_0^x \cos 4t dt$, then $g(x+\pi)$ equals

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

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

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

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

**Answer: A::B**

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**59.** Let $f:[-1,2]\overrightarrow{0,\infty}$ be a continuous function such that $f(x)=f(1-x)f$ or $allx\in[-1,2]\cdot$ Let $R_1=\int_{-1}^{2}xf(x)dx,$ and $R_2$ be the area of the region bounded by $y=f(x),x=-1,x=2,$ and the $x-a\xi s$ . Then $R_1=2R_2$ (b) $R_1=3R_2$ $2R_1$ (d) $3R_1=R_2$

A. $R_1=2R_2$

B. $R_1=3R_2$

C. $2R_1=R_2$

D. $3R_1=R_2$

**Answer: C**

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**60.** $Thevalueof\int_{\sqrt{1n2}}^{\sqrt{1n3}} \frac{x\sin x^2}{\sin x^2+\sin(1n6-x^2)}dxis$ $\frac{1}{4}1n\frac{3}{2}$ (b) $\frac{1}{21}n\frac{3}{2}$ $1n\frac{3}{2}$ (d) $\frac{1}{61}n\frac{3}{2}$

A. $\frac{1}{4}\frac{\log(3)}{2}$

B. $\frac{1}{2}\frac{\log(3)}{2}$

C. $\frac{\log(3)}{2}$

D. $\frac{1}{6}\frac{\log(3)}{2}$

**Answer: A**

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**61.** Let $f$ be a continuous function satisfying $\int_{-\pi}^{t^2}\left(f(x)+x^2\right)dx=\pi+\frac{4}{3}t^3$ for all $t$, then $f\left(\pi^2/4\right)$ is equal to

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

B. $\frac{\pi}{2} - \left(\frac{\pi}{4}\right)^4$

C. $\frac{\pi}{2} - \left(\frac{\pi}{4}\right)^2$

D. $\pi - \frac{\pi^6}{16}$

**Answer: D**

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**62.** Compute the integrals: $\int_0^\infty f\left(x^n + x^{-n}\right) \log x \frac{dx}{x}$

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

B. $0$

C. $-\pi$

D. $2\pi$

**Answer: A**

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## Solved Examples Level 2 Single Correct Answer Type Questions

**1.** Let $f:(0,\infty)\in R$ and $F(x)=\int_0^x f(t)dt$. If $F\left(x^2\right)=x^2(1+x)$ then f (4) equals

A. $5/4$

B. $7$

C. $4$

D. $2$

**Answer: C**

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**2.** For all values of , $\int_{1/e}^{\tan x}\frac{t}{1+t^2}dt+\int_{1/e}^{\tan x}\frac{dt}{t(t+t^2)}$ has the value

A. $1/2$

B. $1$

C. $e/2$

D. $(1/2)(e+1/e)$

**Answer: B**

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**3.** The value of $\int_0^{\sin^2 x} \sin^{-1}\sqrt{t}dt + \int_0^{\cos^2 x} \cos^{-1}\sqrt{t}dt$ is

A. $\pi$

B. $\pi/4$

C. $\pi/2$

D. $\sin^2 + \sin x + x$

**Answer: B**

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**4.** If $\int_{\log 2}^{x} \frac{1}{\sqrt{e^x - 1}} dx = \frac{\pi}{6}$ then x is equal to

A. $x = \log 6$

B. $x = 2 \log 2$

C. $x = 3$

D. $x = 1/2$

**Answer: B**

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**5.** The value of $\lim_{x \to \infty} \frac{\int_0^{\frac{\pi}{2}} \sin^{2m} x dx}{\int_0^{\frac{\pi}{2}} \sin^{2m+1} x dx}$ is equal to

A. $0$

B. $1/2$

C. 2

D. 1

**Answer: D**

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

A. 2

B. $k$

C. $1/2$

D. $I$

**Answer: C**

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**7.** If the equality $\int_0^x \frac{bt\cos 4t}{t^2}dt = \frac{a\sin 4x}{x} - 1$ holds for all x such that $0 < x < \pi/4$ then a and b are given by

A. $a = 1/4, b = 1$

B. $a = 2, b = 2$

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

D. $a = 2, b = 4$

**Answer: A**

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**8.** The value of $\int_0^{\pi/2} \frac{1 + 2\cos x}{(2 + \cos x)^2}dx$ is

A. $-1/2$

B. $2$

C. $1/2$

D. none of these

**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. $5$

B. $7$

C. $4$

D. $3$

**Answer: B**

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**10.** If $f(x) = \begin{vmatrix} \sin x + \sin x 2x + \sin 3x & \sin 2x & \sin 3x \\ 3 + 4\sin x & 3 & 4\sin x \\ 1 + \sin x & \sin x & 1 \end{vmatrix}$, then the value of $\int_0^{\frac{\pi}{2}} f(x)dx$ is

A. $3$

B. $0$

C. $2/3$

D. $1/3$

**Answer: D**

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**11.** If a is a positive integer, then the number of values of a satisfying $\int_0^{\frac{\pi}{2}} \left\{ a^2 \left( \cos 3\frac{x}{4} + \frac{3}{4}\cos x \right) + a\sin x - 20\cos x \right\} dx \leq \frac{a^2}{3}$ is:

A. one

B. two

C. three

D. four

**Answer: D**

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**12.** The area bounded by the curve $y = x^4 - 2x^3 + x^2 + 3$ with x-axis and ordinates corresponding to the minima of y, is

A. $1$

B. $91/30$

C. $30/9$

D. $4$

**Answer: B**

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**13.** The value of $\int_0^{\pi} \sin^n x \cos^{2m+1} x dx$ is

A. $\frac{(2m+1)!}{(n!)^2}$

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

C. $\int_0^{\pi} \cos^{2m-1} x dx$

D. none of these

**Answer: C**

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**14.** $\int_{-\frac{1}{\sqrt{3}}}^{-\frac{1}{\sqrt{3}}} \frac{x^4}{1-x^4} \cos^{-1}\left(\frac{2x}{1+x^2}\right) dx$

A. 0

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

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

D. none of these

**Answer: D**

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**15.** The value of $\int_0^{\pi/2} \sqrt{\sin 2\theta} \sin\theta d\theta$ is

A. $1$

B. $0$

C. $\pi/2$

D. $\pi/4$

**Answer: D**

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**16.** Given $I_m = \int_1^e (\log x)^m dx$. If $\frac{I_m}{K} + \frac{l_{m-2}}{L} = e$ then values of K and L are

A. $1-m, \frac{1}{m}$

B. $\frac{1}{1-m}, m$

C. $\frac{1}{1-m}, \frac{m(m-2)}{m-1}$

D. $\frac{m}{m-1}, m-2$

**Answer: A**

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**17.** If $f(x)=pe^{2x}+qe^{x}+rx$ satisfies the condition $f(0)=-1, f'(In2)=31$ and $\int_0^{In4}(f(x)-rx)dx=\frac{39}{2}$, then the value of $(p+q+r)$ is equal to

A. $P=2, Q=-3, R=4$

B. $P=-5, Q=2, R=3$

C. $P=5, Q=-2, R=3$

D. $P=5, Q=-6, R=3$

**Answer: D**

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**18.** The value of the integral $\int_0^1 \frac{dx}{x^2+2x\cos\alpha+1}, 0<\alpha<\pi$ is

A. $\alpha/(2\sin\alpha)$

B. $\tan^{-1}(\sin\alpha)$

C. $\alpha\sin\alpha$

D. $(\alpha/2)(\sin\alpha)$

**Answer: A**

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**19.** The value of the integral $\int_0^\infty \frac{x\log x}{(1+x^2)^2} dxis$ 0 (b) log 7 (c) 5 log 13 (d) none of these

A. 7

B. 0

C. $5\log 13$

D. $2\log 5$

**Answer: B**

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**20.** If i is the greatest of the definite integrals $I_1 = \int_0^1 e^{-x}\cos^2 dx$, $I_2 = \int_0^1 e^{-x^2}\cos^2 x dx$ and $I_3 = \int_0 e^{-x^2} dx$, $I_4 = \int_0$ then (A) $I_1$ (B) $I_2$ (C) $I_3$ (D) $I_4$

A. $l = l_1$

B. $l = l_2$

C. $l = l_3$

D. $l = l_4$

**Answer: D**

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**21.** v34

A. $\log c$

B. $2\log(c+1)$

C. $3\log c$

D. $\log(c+1)$

**Answer: D**

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**22.** $\int_{-1}^{1} \frac{d}{dx}\left[\tan^{-1}\left(\frac{1}{x}\right)\right]dx =$

A. $\pi/2$

B. $\pi/4$

C. $-\pi/2$

D. none of these

**Answer: C**

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**23.** $Thevalueof\int_0^{\pi}\frac{\sin\left(1+\frac{1}{2}\right)x}{\sin\left(\frac{x}{2}\right)}dxis, n\in I, n\geq 0$ $\frac{\pi}{2}$ (b) 0 (c) $\pi$ (d) $2\pi$

A. $\pi$

B. $2\pi$

C. $3\pi$

D. none of these

**Answer: A**

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**24.** The equation of tangent to the curve $y = \int_{x^2}^{x^3} \frac{dt}{1+t^2}$ at $x = 1$ is $\sqrt{3}x + 1 = y$ (b) $\sqrt{2}y + 1 = x$ $\sqrt{3}x + y = 1$ (d) $\sqrt{2}y = x$

A. $\sqrt{2}y - 1 = x$

B. $\sqrt{3}x - 1 = y$

C. $\sqrt{3}x + 1 = y$

D. $\sqrt{2}y + 1 = x$

**Answer: D**

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**25.** The mean value of the function $f(x) = \frac{1}{x^2 + x}$ on the interval $[1, 3/2]$ is

A. $\log(6/5)$

B. $2\log(6/5)$

C. $4$

D. $\log 3/5$

**Answer: B**

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**26.** Evaluate : $\int_1^{16} \tan^{-1}\sqrt{\sqrt{x}-1}dx$

A. $\frac{16\pi}{3}+2\sqrt{3}$

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

C. $\frac{4}{3}\pi+2\sqrt{3}$

D. $\frac{16}{3}\pi-2\sqrt{3}$

**Answer: D**

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**27.** Let $g(x) = \int_0^x f(t)dt$ , where f is such that $\frac{1}{2} \leq f(t) \leq 1$ for $t \in [0, 1]$ and $0 \leq f(t) \leq \frac{1}{2}$ for $t \in [1, 2]$. then . $g(2)$ satisfies the inequality

A. $-3/2 \leq g(2) < 1/2$

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

C. $3/2 < g(2) \leq 5/2$

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

**Answer: B**

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**28.** A function $f$ is defined by `f(x)=1/(2^(r-1)),1/(2^r),

A. $1/3$

B. $1/4$

C. $2/3$

D. $1/3$

**Answer: C**

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**29.** If $y = \int_1^{t^3} \sqrt[3]{z} \log z dz$ and $x = \int_{\sqrt{t}}^3 z^2 \log z dz$ then $\frac{dy}{dx}$ is

A. $-4t^{5/2}$

B. $32t^{5/2}$

C. $-8t^{3/2}$

D. $-36t^{5/2}$

**Answer: D**

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**30.** Let $I_1 = \int_4^5 e^{(x-5)^2} dx$ and $I_2 = 3\int_{1/3}^{2/3} e^{9(x-2/3)^2} dx$ then the value of $I_1 + I_2$ is

A. $0$

B. $4/3$

C. $7/4$

D. $5/4$

**Answer: A**

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**31.** A line tangent to the graph of the function $y = f(x)$ at the point x = a forms an angle $\frac{\pi}{3}$ with the axis of Abscissa and angle $\frac{\pi}{4}$ at the point x=b then $\int_a^b f''(x)dx$ is

A. $0$

B. $1 - \sqrt{3}$

C. $\sqrt{2}-1$

D. $\sqrt{3}-1$

**Answer: B**

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**32.** The value of $\int_{\pi}^{2\pi}[2\sin x]dx,$ where [] repreents the greatest integer function, is

A. $\pi$

B. $2\pi$

C. $-\pi$

D. $2\pi/3$

**Answer: D**

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**33.** For $x \in R$ and $a$ continuous functio f(x) , let $I_1 \int_{\sin^2 t}^{1+\cos^2 t} xf\{x(2-x)\}dx$ and $I_2 I_1 \int_{\sin^2 t}^{1+\cos^2 t} f(x(2-x))dx$. Then, $\frac{I_1}{I_2}$=

A. 2

B. 1

C. 4

D. none of these

**Answer: B**

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## Solved Examples Numerical Answer Type Questions

**1.** If $\int_0^{\pi} xf\left(\cos^2 x + \tan^4 x\right)dx = k\int_0^{\pi/2} f\left(\cos^2 x + \tan^4 x\right)dx$ then k =

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**2.** The value of $\int_{-2}^{2} \left|1 - x^2\right| dx$ is equal to

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**3.** The value of the integral $\int_{0}^{100\pi} \sqrt{1 - \cos 2x} \ \mathrm{d}x$ is

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**4.** If $\int_{0}^{\frac{\pi}{2}} f(\sin 2x) \sin x dx = A \int_{0}^{\frac{\pi}{4}} f(\cos 2x) \cos x dx$ then the value of $A$ is $\left(\sqrt{2} = 1.41\right)$

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**5.** If $\left| \int_{0}^{\frac{\pi}{2}} \frac{x^2 \cos x}{(1 + \sin x)^2} dx \right|$ is equal to $(\pi = 3.14)$

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6. Evaluate : $\int_0^1 \frac{\sin^{-1}\sqrt{x}}{x^2-x+1}dx$

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7. The value $\frac{2^{2011}I_1}{1005I_2}$, where $I_1=\int_0^1 x^{1004}(1-x)^{1004}dx$ and $I_2=\int_0^1 x^{1004}\left(1-x^{2010}\right)^{1004}dx$ is

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8. $\lim_{n\to\infty}\sum_{n=1}^{n}\frac{\sqrt{n}}{\sqrt{r}\left(3\sqrt{r}+4\sqrt{n}\right)^2}$

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9. If $\int_0^{\pi/2}\sin\theta\log\sin\theta d\theta=\log K$ then $K$ is equal to $(e=2.71)$

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**10.** If $\int_0^1 \frac{dx}{(1+x)(2+x)\sqrt{x(1-x)}} = \pi A$ then A is equal to $(\sqrt{2}=1.41, \sqrt{3}=1.73)$

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**11.** A positive integer $n \leq 5$ such that $\int_0^1 e^{2x-1}(x-1)^n dx = \frac{1}{4}\left(\frac{7}{e} - e\right)$ is

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**12.** Let $f(x) = \int_0^x \frac{dt}{\sqrt{1+t^3}} and g(x)$ be the inverse of $f(x)$ . Then the value of $4\frac{g^x}{(g(x))^2} is$ __

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**13.** If $\int_0^\infty x^{2n+1} \dot{e}^{-x} dx = 360$, then the value of $n$ is___

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**14.** The value $\lim_{n\to\infty}\int_0^1 \frac{\sin nx}{\sin nx+\cos nx}dx$ is

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**15.** Let $I=\int_0^{2020}\frac{\sqrt[3]{x^2}+\sqrt[3]{(1010-x)^2}}{\sqrt[3]{x^2}+2\sqrt[3]{(1010-x)^2}+\sqrt[3]{(2020-x)^2}}$ dx then $\frac{I}{100}$ is equal to

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**16.** If $I_n=\int_0^1\left(1-x^5\right)^n dx$, then $\frac{I_{21}}{I_{20}}$ is equal to

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## Exercise Concept Based Single Correct Answer Type Questions

**1.** The value of $\int_{\pi/4}^{\pi/2} \cot\theta \cos ec^2\theta d\theta$ is

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

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

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

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

**Answer: B**

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**2.** The value of $\lim_{n\to\infty} \frac{1}{n}\left(\sin\left(\frac{\pi}{n}\right) + \sin\left(2\frac{\pi}{n}\right) + \ldots + \sin\left(n\frac{\pi}{n}\right)\right)$ is

A. $\pi$

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

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

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

**Answer: D**

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**3.** Evaluate: $\int_{-\pi/2}^{\pi/2} \frac{x \sin x}{e^x + 1} dx$

A. $2\pi$

B. $1$

C. $2$

D. $\pi/2$

**Answer: B**

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**4.** $\int_{-\pi/2}^{\pi/2} \left(x^{14} \sin^{11} x + \sin^2 x\right) dx$ is equal to

A. $0$

B. $\pi$

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

D. $-\pi$

**Answer: C**

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5. $\int_0^{\pi/2} \frac{dx}{2\cos x + 3}$ is equal to

A. $\frac{2}{\sqrt{5}} \frac{\tan^{-1}(1)}{\sqrt{5}}$

B. $\frac{1}{\sqrt{5}} \frac{\tan^{-1}(1)}{\sqrt{5}}$

C. $1$

D. $\frac{2}{\sqrt{3}} \frac{\tan^{-1}(1)}{\sqrt{5}}$

**Answer: A**

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6. If $\int_0^{\pi/4} \frac{x \sin x}{\cos^3 x} dx = \frac{\pi}{4} + A$, then A is equal to

A. $0$

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

C. $1$

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

**Answer: D**

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7. If $\int_0^2 \frac{dx}{\sqrt{x+1} + \sqrt{(x+1)^3}}$ is equal to $k\pi$ then $k$ is equal to

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

B. $2$

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

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

**Answer: C**

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**8.** If $f$ is continuously differentiable function then $\int_0^{2.5} \left[x^2\right] f'(x)dx$ is equal to

A. $6f(6.25) + \sum_{i \in \left\{1, \sqrt{2}, \sqrt{3}, 2, \sqrt{5}\right\}} f(i)$

B. $6f(6.25) - \sum_{i \in \left\{1, \sqrt{2}, \sqrt{3}, 2, \sqrt{5}, \sqrt{6}\right\}} f(i)$

C. $6f(2.5) - \sum_{i \in \left\{1, \sqrt{2}, \sqrt{3}, 2, \sqrt{5}, \sqrt{6}\right\}} f(i)$

D. $6f(2.5) - \sum_{i \in \left\{1, \sqrt{2}, \sqrt{3}, \sqrt{5}\right\}} f(i)$

**Answer: C**

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**9.** The value of $\int_0^1 x^3(1-x)^{11}dx$ is equal to

A. $\frac{1}{11}+\frac{3}{12}+\frac{3}{13}+\frac{1}{14}$

B. $-\frac{1}{11}+\frac{3}{12}-\frac{3}{13}+\frac{1}{14}$

C. $\frac{8}{13}$

D. $\frac{1}{11}-\frac{3}{12}+\frac{3}{14}-\frac{1}{14}$

**Answer: D**

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**10.** $\int_0^3 |2-x|dx$ equals

A. 1

B. 2

C. 4

D. 3

**Answer: B**

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## Exercise Level 1 Single Correct Answer Type Questions

**1.** The value of $\int_{-2}^{2} |1 - x^2| dx$ is equal to

A. $2$

B. $0$

C. $4$

D. $5$

**Answer: D**

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**2.** If $f(x) = \int_{0}^{x} \sin^8 t dt$, then $f(x + \pi)$ equals

A. $\frac{f(x)}{f(\pi)}$

B. $f(x)f(\pi)$

C. $f(x)+f(\pi)$

D. $f(x)-f(\pi)$

**Answer: C**

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**3.** Suppose that the graph of $y=f(x)$, contains the points $(0,4)$ and $(2,7)$. If $f'$ is continuous then $\int_0^2 f'(x)dx$ is equal to

A. $2$

B. $-2$

C. $3$

D. none of these

**Answer: C**

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**4.** A polynomial P is positive for $x < 0$, and the area of the region bounded by $P(x)$, then x-axis, and the vertical lines $x = 0$ and $x = K$ is $K^2(K+3)/3$. The polynomial $P(x)$ is

A. $x^2 + 2x$

B. $x^2 + x + 1$

C. $x^2 + 2x + 1$

D. $x^3 + 1$

**Answer: A**

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**5.** The value of $\lim_{x \to 0} \frac{\int_0^x \sin t^2 dt}{x^2}$ is

A. 1

B. $0$

C. $2$

D. none of these

**Answer: B**

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

A. $f$ has maximum at $x = 0$

B. $f$ has maximum at $x = -1$

C. $f$ has maximum at $x = -1$

D. $f$ has no critical point

**Answer: B**

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**7.** A line tangent to the graph of the function $y = f(x)$ at the point x = a forms an angle $\frac{\pi}{3}$ with the axis of Abscissa and angle $\frac{\pi}{4}$ at the point x=b then $\int_a^b f''(x)dx$ is

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

B. $-\frac{\pi}{12}$

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

D. $\sqrt{3} - 1$

**Answer: A**

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**8.** The function $F(x) = \int_0^x \frac{\log(1-t)}{1+t}dt$ is

A. an even function

B. an odd function

C. a periodic function

D. none of these

**Answer: A**

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**9.** If $f(n)=\frac{1}{n}\{(n+1)(n+2)(n+3)...(n+n)\}^{1/n}$ then $\lim_{n\to\infty} f(n)$ equals

A. $e$

B. $1/e$

C. $2/e$

D. $4/e$

**Answer: D**

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**10.** The value of the integral $\int_{\alpha}^{\beta} \frac{1}{\sqrt{(x-\alpha)(\beta-x)}} dx$

A. $\sin^{-1} \alpha / \beta$

B. $\pi / 2$

C. $\sin^{-1} \beta / 2\alpha$

D. $\pi$.

**Answer: D**

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**11.** The value of the integral $\int_{0}^{\pi/3} \frac{x \sin x}{\cos^2 x} dx$ is

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

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

C. $3\frac{\pi}{2} - \frac{\log \tan(\pi)}{12}\Big)$

D. none of these

**Answer: B**

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**12.** The value of $\int_{1/e}^{\tan x} \frac{t}{1+t^2}dt + \int_{1/e}^{\cot x} \frac{1}{t(1+t^2)}dt$, where $x \in (\pi/6, \pi/3)$, is equal to :

A. $1/2$

B. $1$

C. $\pi/4$

D. none of these

**Answer: B**

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**13.** The equation of the tangent to the curve $y = \int_{x^4}^{x^6} \frac{dt}{\sqrt{1+t^2}}$ at $x = 1$ is

A. $\sqrt{2}y + 1 = x$

B. $\sqrt{3}x + 1 = y$

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

D. none of these

**Answer: D**

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**14.** The value of $\int_{-1}^{1} x|x|dx$ is

A. $2$

B. $1$

C. $0$

D. none of these

**Answer: C**

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**15.** The difference between the greatest and least values of the function $F(x) = \int_0^x (t+1)dt$ on [1,3] is

A. $8$

B. $2$

C. $6$

D. $11/2$

**Answer: C**

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**16.** Evaluate: $(\lim)_{x \to \infty} \frac{\left(\int 0 x e^{x} \hat{} \, 2 dx\right)^{2}}{\int 0 x e^{2x} \hat{} \, 2 dx}$

A. $1$

B. $2$

C. $3$

D. $0$

**Answer: D**

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**17.** 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 $10^{-9}$

D. none of these

**Answer: A**

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**18.** The value of the integral $\int_0^3 \frac{dx}{\sqrt{x+1}+\sqrt{5x+1}}$ is

A. $11/15$

B. $14/15$

C. $2/5$

D. none of these

**Answer: D**

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**19.** Let $f(x) = \{x\}$, the fractional part of $x$ then $\int_{-1}^{1} f(x)dx$ is equal to

A. $1$

B. $2$

C. $0$

D. $1/2$

**Answer: A**

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**20.** The value of $\int_{-\pi/2}^{\pi/2} \cos t \sin(2t - \pi/4) dt$ is

A. $-1/3$

B. $1/3$

C. $\sqrt{2}/3$

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

**Answer: D**

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21. $\int_0^{\infty} \frac{x \log x}{(1+x^2)^2} dx =$

A. $0$

B. $1$

C. $\sqrt{3}/2$

D. $\sqrt{5}/2$

**Answer: A**

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22. $\int_0^1 |\sin 2\pi x| dx$ id equal to

A. $0$

B. $-1/\pi$

C. $1/\pi$

D. $2/\pi$

**Answer: D**

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**23.** The value of $\lim_{x \to \infty} \frac{\int_0^x \left(\tan^{-1} x\right)^2}{\sqrt{x^2+1}} dx$

A. $\pi/4$

B. $\pi^2/2$

C. $\pi^2/4$

D. $\pi$

**Answer: C**

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**24.** If $A(t) = \int_{-1}^{t} e^{-|x|} dx$, then $\lim_{t \to \infty} A(t)$ is equal to

A. $2 - e^{-1}$

B. $3 - e^{-1}$

C. $4$

D. $0$

**Answer: A**

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**25.** If the value of $\int_{-2}^{2} |x \cos \pi x| dx = k/\pi$ then the value of $k$ is

A. $4$

B. $8$

C. $12$

D. none of these

**Answer: B**

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**26.** The value of the integral $\int_0^{\pi} \frac{x dx}{1+\cos\alpha \sin x}, 0 < \alpha < \pi$, is

A. $\frac{\pi}{\sin\alpha}$

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

C. $\frac{\pi}{\cos\alpha}$

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

**Answer: A**

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**27.** The value of $\lim_{n\to\infty}\left(\frac{1}{n}+\frac{n}{(n+1)^2}+\frac{n}{(n+2)^2}+\ldots+\frac{n}{(2n-1)^2}\right)$ is

A. 1

B. $1/3$

C. $1/2$

D. $3/2$

**Answer: C**

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**28.** The value of $\lim_{n\to\infty}\left(\frac{1}{1^3+n^3}+\frac{2^2}{2^3+n^3}+\ldots\ldots\ldots+\frac{n^2}{n^3+n^3}\right)$ is :

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

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

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

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

**Answer: B**

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

A. $0$

B. $1$

C. $1/2$

D. $\pi/3$

**Answer: A**

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**30.** If $f(x) = A\sin\left(\frac{\pi x}{2}\right) + B$, $f'\left(\frac{1}{2}\right) = \sqrt{2}$ and $\int_0^1 f(x)dx = \frac{2A}{\pi}$ then constants $A$ and $B$ are

A. $\pi/2$

B. $2/\pi, 3/\pi$

C. $0, 4/\pi$

D. $4/\pi, 0$

**Answer: D**

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**31.** If $\frac{d}{dx}f(x) = g(x)$ for $a \leq x \leq b$ then, $\int_a^b f(x)g(x)dx$ equals

A. $g(b) - g(a)$

B. $f(b) - f(a)$

C. $\frac{(f(b))^2 - (f(a))^2}{2}$

D. $\frac{(g(b))^2 - (g(a))^2}{2}$

**Answer: C**

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**32.** Let $I_1 = \int_a^b \left(\int_a^x f(t)dt\right)dx$ and $I_2 = \int_a^b (b-x)f(x)dx$ then

A. $I_1 = I_2$

B. $I_1 = (b - a) + I_2$

C. $I_1 = (b - a)I_2$

D. none of these

**Answer: A**

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**33.** The least value of the function $F(x) = \int_x^2 \log_{1/3} t dt, x \in [1/10, 4]$ is at $x =$

A. $1/10$

B. $4$

C. $1$

D. none of these

**Answer: C**

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**34.** The greatest value of the function $F(x) = \int_4^x (t^2 - 8t + 16)dt$ on $[0, 5]$ is

A. $5$

B. $1/3$

C. $4$

D. $2/3$

**Answer: B**

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**35.** If for a continuous function f, $\int_{-a}^{a} f(x)dx = K\int_0^a (f(x) + f(-x))$ dx then the value of $K$ is

A. $1$

B. $1/2$

C. $2$

D. $a$

**Answer: A**

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**36.** If $I_n = \int_1^e (\log x)^n dx$ then $I_8 + 8I_7 =$

A. $2$

B. $e^8$

C. $2e$

D. $e$

**Answer: D**

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**37.** Let $f_1(x) = \int_0^x f(t)dt$, $f_2(x) = \int_0^x f_1(t)dt$ and $f_3(x) = \int_0^x f_2(t)dt$ if $f_3(x) = A\int_0^x f(t)(x-t)^2 dt$ then the value of A is

A. $1$

B. $1/2$

C. $2$

D. none of these

**Answer: B**

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**38.** If variables x and y are related by the equation

$x = \int_0^y \frac{1}{\sqrt{1+9u^2}}$ du, then $\frac{dy}{dx}$ is equal to

A. $4$

B. 6

C. 5

D. 9

**Answer: D**

Watch Video Solution

**39.** If $y = f(x)$ be an invertible function with inverse $g$ and $h(x) = xf(x)$, then $\int_{f(a)}^{f(b)} g(x)dx + \int_a^b f(x)dx$ is equal to

A. $h(a) - h(b)$

B. $h(b) - h(a)$

C. $h(a) + h(b)$

D. $bh(b) - ah(a)$

**Answer: B**

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**40.** The value of $\int_0^{[x]} \frac{2^t}{2^{[t]}} dt$

A. $[x]\log 2$

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

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

D. $\frac{1}{4}\frac{[x]}{\log 2}$

**Answer: B**

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**41.** If $a_n = \int_0^{\pi/2} \frac{\sin^2 nx}{\sin x} dx$ then $a_2 - a_1, a_3 - a_2, a_4 - a_3$ are in

A. A.P.

B. G.P.

C. H.P.

D. Arith - Geo progression

**Answer: C**

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**42.** $\int_0^{21} [x]^4 dx$ is equal

A. $44100$

B. $2100$

C. $48400$

D. $42400$

**Answer: A**

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**43.** If $f(x)$ is a function satisfying $f\left(\frac{1}{x}\right) + x^2 f(x) = 0$ for all non zero $x$ then $\int_{\cos\theta}^{\sec\theta} f(x)dx =$

A. $\sin 2\theta$

B. $1$

C. $\sec\theta - \cos\theta$

D. $0$

**Answer: D**

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## Exercise Level 2 Single Correct Answer Type Questions

**1.** The value of $\int_{\pi/4}^{\pi/3} \frac{dx}{\sin x + \tan x}$ is

A. $3/4$

B. $1/2$

C. $2/3 - \sqrt{2}/2$

D. none of these

**Answer: D**

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**2.** If $f$ is integrable on $[a, b]$ then $\int_a^b [f(x) - f_{\text{ave}}]dx$ is equal to

A. $f(b) - f(a)$

B. $\frac{1}{2}(f(b) - (a))$

C. $f(a) - f(b)$

D. $0$

**Answer: D**

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**3.** If $m \neq n, mn \in N$ then the value of $\int_0^{2\pi} \cos mx \cos nx dx$ is

A. $0$

B. $2\pi$

C. $\pi$

D. dependent on $m$ and $n$

**Answer: A**

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**4.** If

$Q(x) = \frac{1}{2}a_0 + a_1 \cos x + b_1 \sin x + a_2 \cos 2x + \ldots + a_n \cos nx + b_n \sin nx$

, then the value of $\int_0^{2\pi} Q(x) \sin kx dx (k = 1, 2, \ldots n)$

A. $\pi a_k$

B. $\pi a_0$

C. $\pi b_n$

D. $\pi b_k$

**Answer: D**

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**5.** The value of $\int_{-\sqrt{3}}^{\sqrt{3}} \left( \frac{d}{dx} \left( \tan^{-1} \left( \frac{1}{x} \right) \right) + x^3 \right) dx$ is

A. $\pi / 2$

B. $\pi / 4$

C. 1

D. none of these

**Answer: D**

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**6.** The value of $\int_{1/2}^{1} \left( 2x \frac{\sin(1)}{x} - \frac{\cos(1)}{x} \right) dx$ is

A. $\sin 1$

B. $\cos 1$

C. $2 \sin 1$

D. none of these

**Answer: D**

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**7.** Let $f$ be a continuous function $[a, b]$ such that $f(x) > 0$ for all $x \in [a, b]$. If $F(x) = \int_a^x f(t)dt$ then

A. F is differentiable but not increasing on [a, b]

B. F is differentiable and increasing on [a, b]

C. F is continuous and decreasing on [a, b]

D. F is neither differentiable nor increasing on [ a, b]

**Answer: B**

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**8.** Let $f$ be a continuous function on R satisfying $f(x+y)=f(x)+f(y)$ for all $x, y \in R$ with $f(1)=2$ and $g$ be a function satisfying $f(x)+g(x)=e^x$ then the value of the integral $\int_0^1 f(x)g(x)dx$ is

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

B. $\frac{1}{4}(e-2)$

C. $2/3$

D. $\frac{1}{2}(e-3)$

**Answer: C**

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**9.** If $f(x)=\cos ec\left(x-\frac{\pi}{3}\right)\cos ec\left(x-\frac{\pi}{6}\right)$, then the value of $\int_0^{\frac{\pi}{2}} f(x)dx$ is

A. $2\log 3$

B. $-2\log 3$

C. $\log 3$

D. $1/4$

**Answer: B**

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**10.** $\int_0^1 \log\left(\sqrt{1-x}+\sqrt{1+x}\right)dx$ equals:

A. $\frac{1}{2}\left(\log 2-\frac{1}{2}+\frac{\pi}{4}\right)$

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

C. $\frac{1}{3}\left(\log 4-1+\frac{\pi}{8}\right)$

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

**Answer: B**

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**11.** If $l = \int_0^{1/2} \frac{dx}{\sqrt{1-x^{2n}}}, n \in N$ then

(Where, $[.]$ denotes G.I.F)

A. less than 1

B. more than $1/2$

C. more than $1$

D. less than $1/2$

**Answer: A**

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**12.** The numbers A, B and C such that a function of the form $f(x) = Ax^2 + Bx + C$ satisfies the conditions $f'(1) = 8, f(2) + f''(2) = 33$ and $\int_0^1 f(x)dx = 7/3$, are

A. $A = 1, B = -4, C = 2$

B. $A = 7, B = -6, C = 3$

C. $A = 8, B = -6, C = 3$

D. none of these

**Answer: B**

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**13.** The equation of the tangent to the curve $y = \int_x^{x^2} \log t dt$ at $x = 2$ is

A. $y - 6\log 2 = 7\log 2(x - 2)$

B. $y - \log 2e^{1/3} = (\log 2)x$

C. $y - 8\log 2e^{-1/3} = 5\log 2x$

D. $y + 8\log 2 + 2 = (7\log 2)x$

**Answer: D**

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**14.** The value of $\int_{-\pi/2}^{\pi/2}\left(\frac{2-\sin\theta}{2+\sin\theta}\right)d\theta$ is

A. $0$

B. $1$

C. $2$

D. none of these

**Answer: A**

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**15.** The value of the integral $\int_{0}^{\pi/4}\frac{\sin x+\cos x}{3+\sin 2x}dx$,is

A. $\log 2$

B. $\log 3$

C. $(1/4)\log 3$

D. $(1/8)log3$

**Answer: C**

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**16.** If $I_1 = \int_x^1 \frac{1}{1+t^2}dt$ and $I_2 = \int_1^{\frac{1}{x}} \frac{1}{1+t^2}dt$ for $x > 0$ then (A) $I_1 = I_2$ (B) $I_1 > I_2$ (C) $I_1 < I_2$ (D) None of these

A. $I_1 > I_2$

B. $I_1 = I_2$

C. $I_2 > I_1$

D. $I_2 = (\pi/2) - \tan^{-1} x$

**Answer: A**

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**17.** The solution for x of the equation

$$\int_{\sqrt{2}}^{x} \frac{1}{t\sqrt{t^2-1}}dt = \frac{\pi}{2}, \text{ is}$$

A. $1$

B. $2$

C. $3$

D. $\sqrt{3}$

**Answer: B**

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**18.** The mean value of the function $f(x) = \frac{2}{e^x+1}$ in the interval [0,2] is

A. $\frac{\log(2)}{e^2+1}$

B. $1+\frac{\log(2)}{e^x+1}$

C. $2+\frac{\log(2)}{e^2+1}$

D. $2+\log\left(e^2+1\right)$

**Answer: C**

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**19.** $\int_0^{\pi} x \log \sin x dx$

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

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

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

D. none of these

**Answer: A**

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**20.** $\int_{-ip}^{\pi} [\cos px - \sin qx]^2$ dx where p,q are integers is equal to

A. $-\pi$

B. $0$

C. $\pi$

D. $2\pi$

**Answer: D**

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**21.** Let $f, g$ and $h$ be continuous functions on $[0, a]$ such that $f(x) = f(a - x), g(x) = -g(a - x)$ and $3h(x) - 4h(a - x) = 5$. Then $\int_0^a f(x)g(x)h(x)dx$ is equal to

A. $5/4$

B. $3/4$

C. $1$

D. none of these

**Answer: D**

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**22.** $If \int_{\frac{\pi}{3}}^{x} \sqrt{(3-\sin^2 t)}dt + \int_{0}^{y} \cos t dt = 0, the \neq valuate \frac{dy}{dx}$

A. $1$

B. $2$

C. $\sqrt{3}$

D. $= 0$

**Answer: A**

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**23.** If $P(x)$ is a polynomial of the least degree that has a maximum equal to 6 at $x = 1$, and a minimum equalto 2 at $x = 3$,then $\int_{0}^{1} P(x)dx$ equals:

A. $17/4$

B. $13/4$

C. $19/4$

D. $5/4$

**Answer: C**

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**24.** Let $P(x)$ be a polynomial of least degree whose graph has three points of inflection $(-1, -1), (1.1)$and a point with abscissa 0 at which the curve is inclined to the axis of abscissa at an angle of $60^\circ$. Then find the value of $\int_0^1 p(x)dx$.

A. $1$

B. $\sqrt{2}-1$

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

D. none of these

**Answer: D**

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**25.** $\lim_{n \to \infty} \left\{ \frac{e^{1/n}}{n^2} + \frac{2 \cdot \left(e^{1/n}\right)^2}{n^2} + \frac{3 \cdot \left(e^{1/n}\right)^3}{n^2} + \ldots + \frac{n \cdot \left(e^{1/n}\right)^n}{n^2} \right\}$

A. $1$

B. $0$

C. $e$

D. none of these

**Answer: A**

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**26.** The value of $\int_0^1 \lim_{n \to \infty} \sum_{k=0}^{n} \frac{x^{k+2} 2^k}{k!} dx$ is:

A. $e^2 - 1$

B. 2

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

D. $\frac{e^2-1}{4}$

**Answer: D**

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**27.** The value of $\int_0^1 \frac{x^{2\alpha}-1}{\log x}dx$, if $\alpha = \frac{2n-1}{2}$ is

A. $\log n$

B. $2\log n$

C. $\log 2n$

D. $(1/2)\log n$

**Answer: C**

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**28.** The value of $\alpha \in (-\pi, 0)$ satisfying $\sin\alpha + \int_{\alpha}^{2\alpha} \cos 2x dx = 0$, is

A. $-\pi/2$

B. $-\pi$

C. $-\pi/3$

D. $-\pi/4$

**Answer: C**

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**29.** Let $g(x) = \begin{cases} 1 & , \ 0 \leq x < 1 \\ x^3 & , \ 1 \leq x < 4 \\ \sqrt{x} & , \ 4 \leq x < 9 \end{cases}$ then $\int_0^9 g(x)dx$ is

A. $243/12$

B. $9\sqrt{3}$

C. $929/12$

D. none of these

**Answer: C**

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

A. $f(0)$

B. $0$

C. $f(4) / f(0)$

D. $f(0) / f(4)$

**Answer: D**

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**31.** If $f(x) = \begin{cases} e^{\cos x} \sin x & |x| \leq 2 \\ 2 & otherwise \end{cases}$ then $\int_{-2}^{3} f(x)dx =$ (A) 0 (B) 1 (C) 2 (D) 3

A. $0$

B. $1$

C. $2$

D. $3$

**Answer: C**

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

A. $\pi/2$

B. $a\pi$

C. $\pi$

D. $2\pi$

**Answer: A**

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**33.** Let $f:(0,\infty)\in R$ and $F(x)=\int_0^x f(t)dt$. If $F\left(x^2\right)=x^2(1+x)$ then f (4) equals

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

B. 7

C. 4

D. 2

**Answer: C**

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**34.** 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. $\pm \frac{1}{\sqrt{2}}$ c.$\pm \frac{1}{2}$ d. 0&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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**35.** If $I(m, n) = \int_0^1 t^m (1 + t)^n . dt$, then the expression for I(m,n) in terms of I(m+1,n-1) is:

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

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

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

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

**Answer: A**

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36. $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$

A. $1$

B. $\pi$

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

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

**Answer: C**

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**37.** 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. $-\frac{2}{5}$

C. $\frac{2}{\sqrt{5}}$

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

**Answer: A**

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**38.** $\int_{-2}^{0}\{x^3+3x^2+3x+3+(x+1)\cos(x+1)dxisequa < o\ -4$ (b) 0 (c) 4 (d) 6

A. $-4$

B. $0$

C. 4

D. 6

**Answer: C**

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## Exercise Level 2 Numerical Answer Type Questions

**1.** If $\frac{K_n}{L_n} = 1024$ where $K_n = \int_0^1 x^n(2-x)^n dx, L_n = \int_0^1 x^n(1-x)^n dx$, then $n$ is equal to

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**2.** Let $f: R \to R$ be a differentiable function, such that $f(0) = 0, f\left(\frac{\pi}{3}\right) = 3.53.$ If $G(x) = \int_x^{\frac{\pi}{3}} (f'(t)\sec t + \sec t \tan t f(t))dt, x \in \left(0, \frac{\pi}{2}\right]$, then $\lim_{x \to \infty} G(x)$ is equal to

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**3.** The integral solution of $\int_{\sqrt{2}}^{x} \frac{dx}{\sqrt{x^2-1}} = \frac{\pi}{12}$ is.

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**4.** Evaluate : $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\cot x}}$

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**5.** The value of $\frac{1}{10}\left(\int_{0}^{100\pi+V} |\sin x| dx\right) + \cos V$ is $(0 \leq V \leq \pi)$

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**6.** For $x > 0, let f(x) = \int_{1}^{x} \frac{\log t}{1+t} dt$. Find the function $f(x) + f\left(\frac{1}{x}\right)$ and find the value of $f(e) + f\left(\frac{1}{e}\right)$.

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7. The value of $\int_{-1}^{1} \frac{x}{\sqrt{1-x^2}} \log\left(\frac{1+x}{1-x}\right) dx$ is $(\pi = 3.14)$

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8. $9! \int_{0}^{1} x^4 (1-x)^5 dx$ is equal to.

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9. $\int_{1/2}^{1} \frac{dx}{\sqrt{3x^2+2x-1}}$ is equal to $(\pi = 3.14)$

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10. The value of $\int_{1}^{e^{37}} \frac{\sin(\pi \log x)}{x} dx$ is $(\pi = 3.14)$

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

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**12.** The value of $\int_{\pi/4}^{3\pi/4} \frac{\phi}{1+\sin\phi}d\phi$ is

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**13.** For $x \in R$ and $a$ continuous functio f(x) , let $I_1 \int_{\sin^2 t}^{1+\cos^2 t} xf\{x(2-x)\}dx$ and $I_2 I_1 \int_{\sin^2 t}^{1+\cos^2 t} f(x(2-x))dx$. Then, $\frac{I_1}{I_2}$=

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**14.** The value of $\frac{d}{dx}\int_{x^2}^{x} \sqrt{\cos t}dt$ at $x = 0$ is

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**15.** The value of $\int_0^{1.5} x^2[x^2]dx$ is $(\sqrt{2}=1.41)$

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**16.** If $I=\int_0^{\pi}\sin^3\theta(1+2\cos\theta)(1+\cos\theta)^2d\theta$ then the value of $I$ is

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

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**18.** If $I=\int_0^{\pi/4}\left(\sqrt{\sin x}+\sqrt{\cos x}\right)^{-4}dx$ then $I$ equals

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19. If $I = \int_0^{\pi} \frac{x^2 \sin x}{(2x-1)(1+\cos^2 x)} dx$ then the value of $I$ is $(\pi = 3.14)$

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## Questions From Previous Years Aieee Jee Main Papers

1. $\int_0^{\sqrt{2}} [x^2] dx$

A. $2 - \sqrt{2}$

B. $2 + \sqrt{2}$

C. $\sqrt{2} - 1$

D. $\sqrt{2} - 2$

**Answer: C**

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2. If $I_n = \int_0^{\pi/4} \tan^n x dx$, $\lim_{n \to \infty} n(I_{n+1} + I_{n-1})$ equals

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

B. $1$

C. $\infty$

D. $0$

**Answer: B**

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3. $\int_{\pi}^{10\pi} |\sin x| dx$ is equal to (A) 20 (B) 8 (C) 10 (D) 18

A. $20$

B. $8$

C. $10$

D. $18$

**Answer: D**

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**4.** 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 $\int_0^2 x f'(x)\, dx$, is

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

B. $1$

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

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

**Answer: D**

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**5.** Let f(x) be a function satisfying $f'(x) = f(x)$ with $f(0) = 1$ and g(x) be a function that satisfies $f(x) + g(x) = x^2$ . Then the value of the integral $\int_0^1 f(x)g(x)dx$, is

A. $e + \frac{e^2}{2} - \frac{3}{2}$

B. $e - \frac{e^2}{2} - \frac{3}{2}$

C. $e + \frac{e^2}{2} + \frac{5}{2}$

D. $e - \frac{e^2}{2} - \frac{5}{2}$

**Answer: B**

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**6.** If $f(y) = e^y, g(y) = y, y > 0,$ and $F(t) = \int_0^t f(t-y)g(y)dy,$ then

A. $F(t) = e^t - (1+t)$

B. $F(t) = te^t$

C. $F(t) = te^{-t}$

D. $F(t) = 1 - e^t(1 + t)$

**Answer: A**

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

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

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

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

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

**Answer: A**

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**8.** The value of the integral $l = \int_0^1 x(1-x)^n dx$ is

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

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

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

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

**Answer: B**

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**9.** The value of $\lim_{x\to 0}\frac{\int_0^{x^2}\sec^2 t dt}{x\sin x}dx$ , is

A. 2

B. 1

C. 0

D. 3

**Answer: B**

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**10.** The value of $\int_{-2}^{3} |1 - x^2| dx$

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

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

C. $\frac{28}{3}$

D. `1/3

**Answer: C**

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**11.** The value of $\int_{0}^{\pi/2} \frac{(\sin x + \cos x)^2}{\sqrt{1 + \sin 2x}} dx$ is

A. 2

B. 1

C. 0

D. $3$

**Answer: A**

Watch Video Solution

**12.** If $\int_0^{\pi} x f(\sin x)dx = A\int_0^{\pi/2} f(\sin x)dx,$ then A is equal to

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

B. $\pi$

C. $0$

D. $2\pi$

**Answer: B**

Watch Video Solution

**13.** $If f(x) = \frac{e^x}{1+e^x}, I_1 = \int_{f(-a)}^{f(a)} xg(x(1-x)dx, and$ $I_2 = \int_{f(-a)}^{f(a)} g(x(1-x))dx, then the value of \frac{f(I_2)}{I_1} is -1$ (b) $-2$ (c) 2 (d) 1

A. $-1$

B. $-3$

C. 2

D. 1

**Answer: C**

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**14.** Evaluate: $(\lim)_{n \to \infty} \left[\frac{1}{n^2}\frac{\sec^2 1}{n^2} + 2/n^2 \frac{\sec^2 4}{n^2} + + \frac{1}{n}\sec^2 1\right]$

A. $\tan 1$

B. $\tan 1$

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

D. $\frac{1}{2}\cos ec1$

**Answer: B**

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**15.** Let $f: R\overrightarrow{R}$ be a differentiable function having $f(2) = 6, f'(2) = \frac{1}{48}$. Then evaluate $(\lim)_{x \overrightarrow{2}} \int_6^{f(x)} \frac{4t^3}{x-2} dt$

A. 12

B. 18

C. 24

D. 36

**Answer: B**

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**16.** 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 $I_4 = \int_1^2 2^{x^2} dx$ then

A. $I_3 = I_4$

B. $I_3 > I_4$

C. $I_2 > L_1$

D. $I_1 > I_2$

**Answer: D**

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**17.** The value of $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x dx}$ where agt 0, is

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

B. $2\pi$

C. $a\pi$

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

**Answer: D**

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**18.** The value of the integral $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}}dx$ is

A. $1$

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

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

D. $2$

**Answer: C**

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19. $\int_{-3\pi/2}^{-\pi/2} \left\{(x+\pi)^3 + \cos^2(x+3\pi)\right\} dx$, is

A. $\left(\frac{\pi}{4}\right) - 1$

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

C. $\frac{\pi^4}{32} + \left(\frac{\pi}{2}\right)$

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

**Answer: D**

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

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

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

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

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

**Answer: A**

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

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

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

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

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

**Answer: C**

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**22.** 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. $\frac{1}{2}$

B. $0$

C. $1$

D. $2$

**Answer: A**

Watch Video Solution

**23.** The solution for x of the equation

$\int_{\sqrt{2}}^{x} \frac{dt}{\sqrt{t^2-1}} = \frac{\pi}{12}$ is

A. $2$

B. $-\sqrt{2}$

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

D. $2\sqrt{2}$

**Answer: B**

Watch Video Solution

**24.** Let $I = \int_0^1 \frac{\sin x}{\sqrt{x}} dx$ and $I = \int_0^1 \frac{\cos x}{\sqrt{x}} \int dx.$

Then, which one of the following is true?

A. $I > 2/3, J > 2$

B. $1 < 2/3, J < 2$

C. $I < 2/3, J > 2$

D. $I > 2/3, J < 2$

**Answer: B**

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

A. $-1$

B. $-\pi/2$

C. $\pi/2$

D. $1$

**Answer: B**

Watch Video Solution

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

Then $\int_0^1 p(x) dx$ is equal to

A. $41$

B. $42$

C. $\sqrt{41}$

D. 21

**Answer: D**

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**27.** The value of $\int \frac{8\log(1+x)}{1+x^2}dx$ is

A. $\log 2$

B. $\pi \log 2$

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

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

**Answer: B**

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**28.** For $x\varepsilon\left(0, \frac{5\pi}{2}\right)$, definite $f(x) = \int_0^x \sqrt{t}\sin t dt$. Then $f$ has

A. local maximum at $\pi$ and local minimum at $2\pi$

B. local maximum at $\pi$ and $2\pi$

C. local minimum at $\pi$ and $2\pi$

D. local minimum at $\pi$ and local maximum at $2\pi$

**Answer: A**

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**29.** Let [] denote the greatest integet function then the value $\int_0^{1.5} x\left[x^2\right].dx$

A. $0$

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

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

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

**Answer: C**

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**30.** $If g(x) = \int_0^x \cos 4t dt$, then $g(x+\pi)$ equals

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

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

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

D. $\frac{g(x)}{g(\pi)}$

**Answer: A::B**

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**31.** The intercepts on x-axis made by tangents to the curve, $y = \int_0^x |t| dt, x \in R,$ which are parallel to the line $y = 2x$ , are equal to

(1) $\pm 2$ (2) $\pm 3$ (3) $\pm 4$ (4) $\pm 1$

A. $\pm 2$

B. $\pm 3$

C. $\pm 4$

D. $\pm 1$

**Answer: D**

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**32.** Statement I The value of the integral $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$

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

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

A. $\pi$

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

C. $4\pi$

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

**Answer: B**

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**34.** Variable x and y are related by equation $x = \int_0^y \frac{dt}{\sqrt{1+t^2}}$. The value of $\frac{d^2y}{dx^2}$ is equal to

A. $y$

B. $\sqrt{1+y^2}$

C. $\sqrt{1+y^2}$

D. $y^2$

**Answer: A**

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**35.** The integral $\int_{7\pi/4}^{7\pi/3} \sqrt{\tan^2 x} dx$ is equal to

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

B. $\log 2$

C. $2\log 2$

D. $\log \sqrt{2}$

**Answer: A**

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**36.** The integral $\int_0^{\pi} \sqrt{1+4\frac{\sin^2 x}{2}-4\frac{\sin x}{2}}dx$ equal (1) $\pi-4$ (2) $\frac{2\pi}{3}-4-4\sqrt{3}$ (3) $4\sqrt{3}-4$ (4) $4\sqrt{3}-4-\frac{\pi}{3}$

A. $\pi-4$

B. $\frac{2\pi}{3}-4$

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

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

**Answer: D**

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**37.** the integral $\int_0^{\frac{1}{2}} \frac{\ln(1+2x)}{1+4x^2}dx$ equals

A. $\frac{\pi}{4}\log 2$

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

C. $\frac{\pi}{16}\log 2$

D. $\frac{\pi}{32}\log 2$

**Answer: C**

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**38.** If for $n \geq 1$, $P_n = \int_1^e (\log x)^n dx$, then $P_{10} - 90P_8$ is equal to

A. $-9$

B. $10e$

C. $-9e$

D. $10$

**Answer: C**

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**39.** $\int_0^{\pi} [\cos x] dx$, [] denotes the greatest integer function , is equal to

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

B. $0$

C. $-1$

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

**Answer: D**

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**40.** If for a continuous function $f(x)$, $\int_{-\pi}^{t}(f(x)+x)dx = \pi^2 - t^2$, for all $t \geq -\pi$, then $f\left(-\frac{\pi}{3}\right)$ is equal to:

A. $\pi$

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

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

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

**Answer: A**

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**41.** Let function F be defined as $f(x) = \int_1^x \frac{e^t}{t} dtx > 0$ then the vaiue of the integral $\int_1^1 \frac{e^t}{t+a} dt$ where $a > 0$ is

A. $e^a[F(x) - F(1+a)]$

B. $e^{-a}[F(x+a) - F(a)]$

C. $e^a[F(x+a) - F(1+a)]$

D. $e^{-a}[F(x+a) - F(1+a)]$

**Answer: D**

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**42.** The integral $\int_2^4 \frac{\log x^2}{\log x^2 + \log(36 - 12x + x^2)dx}$ is equal to: (1) 2 (2) 4 (3) 1 (4) 6

A. 2

B. $4$

C. $1$

D. $6$

**Answer: A**

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**43.** Let $f:\mathbb{R}\to\mathbb{R}$ be a function such that $f(2-x)=f(2+x)$ and $f(4-x)=f(4+x)$, for all $x\in\mathbb{R}$ and $\int_0^2 f(x)dx=5$. Then the value of $\int_{10}^{50} f(x)dx$ is

A. $80$

B. $100$

C. $125$

D. $200$

**Answer: B**

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**44.** Let $f:(-1,1)\to R$ be continous function , if $\int_0^{\sin x} f(t)dt=\frac{\sqrt{3}}{2}x$, then $f\left(\frac{\sqrt{3}}{2}\right)$ is equal to

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

B. $\sqrt{3}$

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

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

**Answer: B**

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

A. $\frac{1}{4}(\log x)^2$

B. $\frac{1}{2}(\log x)^2$

C. $\log x$

D. $\log x^2$

**Answer: B**

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**46.** If $2\int_0^1 \tan^{-1} x dx = \int_0^1 \cot^{-1}(1-x+x^2)dx$ then $\int_0^1 \tan^{-1}(1-x+x^2)dx =$

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

B. $\log 2$

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

D. $\log 4$

**Answer: B**

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

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

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

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

D. $3 \log 3 - 2$

**Answer: B**

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48. $\int_4^{10} \frac{[x^2]}{[x^2 - 28x + 196] + [x^2]} dx$ is (A) 3 (B) 5 (C) 7 (D) 9

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

B. 6

C. 7

D. 3

**Answer: D**

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**49.** The integral $\int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{8\cos 2x}{(\tan x + \cot x)^3} dx$ equals

A. $\frac{15}{128}$

B. $\frac{15}{64}$

C. $\frac{13}{32}$

D. $\frac{13}{256}$

**Answer: A**

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**50.** If $\int_1^2 \frac{dx}{(x^2 - 2x + 4)^{\frac{3}{2}}} = \frac{k}{k+5}$ then $k$ is equal to

A. 1

B. 2

C. 3

D. 2

**Answer: A**

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51. $\int_{\pi/4}^{3\pi/4} \frac{dx}{1+\cos x} =$

A. $-1$

B. $-2$

C. 2

D. 4

**Answer: C**

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**52.** Find $a$ for which

$$\lim_{n\to\infty}\frac{1^a+2^a+3^a+\ldots+n^a}{(n+1)^{a-1}[(na+1)+(na+2)+\ldots+(na+n)]}=\frac{1}{60}$$

A. $7$

B. $8$

C. $\frac{15}{2}$

D. $\frac{17}{2}$

**Answer: A**

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**53.** If i is the greatest of the definite integrals $I_1=\int_0^1 e^{-x}\cos^2 dx, I_2=\int_0^1 e^{-x^2}\cos^2 x dx$ and $I_3=\int_0^1 e^{-x^2}dx, I_4=\int_0^1$ then (A) $I_1$ (B) $I_2$ (C) $I_3$ (D) $I_4$

A. $I_3>I_1>I_2$

B. $I_2 > I_3 > I_1$

C. $I_2 > I_1 > I_3$

D. $I_3 > I_2 > I_1$

**Answer: D**

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**54.** The value of the integral $\int_{-\pi/2}^{\pi/2} \sin^4 x \left(1 + \log\left(\frac{2+\sin x}{2-\sin x}\right)\right) dx$ is

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

B. $0$

C. $\frac{3}{16}\pi$

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

**Answer: A**

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

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

B. $4\pi$

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

D. $\frac{\pi}{8}$

**Answer: C**

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**56.** The value of $\int_0^{\pi} |\cos x|^3 dx$ is :

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

B. $0$

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

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

**Answer: D**

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**57.** If $\int_0^{\pi/3} \frac{\tan\theta}{\sqrt{2k\sec\theta}} d\theta = 1 - \frac{1}{\sqrt{2}}, (k > 0)$, then the value of k is

A. $2$

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

C. $4$

D. $1$

**Answer: A**

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**58.** $\lim_{n \to \infty} \left( \frac{n}{n^2 + 1^2} + \frac{n}{n^2 + 2^2} + \frac{n}{n^2 + 3^2} + \ldots\ldots + \frac{1}{5n} \right)$ is equal to :

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

B. $\tan^{-1} 2$

C. $\tan^{-1} 3$

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

**Answer: B**

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**59.** If $|f(x) - f(y)| \leq 2|x - y|^{\frac{3}{2}} \ \forall x, y \in R$ and $f(0) = 1$ then value of $\int_0^1 f^2(x)dx$ is equal to (a) 1 (b) 2 (c) $\sqrt{2}$ (d) 4

A. $0$

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

C. $2$

D. $1$

**Answer: D**

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**60.** The value of $\int_{-\pi/2}^{\pi/2} \frac{dx}{[x]+[\sin x]+4}$, where [t] denotes the greatest integer less than or equal to t , is

A. $\frac{1}{12}(7\pi+5)$

B. $\frac{3}{10}(4\pi-3)$

C. $\frac{1}{12}(7\pi-5)$

D. $\frac{3}{20}(4\pi-3)$

**Answer: B**

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**61.** If $\int_0^x f(t)dt = x^2 + \int_x^1 t^2 f(t)dt$, then $f'\left(\frac{1}{2}\right)$ is

A. $\frac{6}{25}$

B. $\frac{24}{25}$

C. $\frac{18}{25}$

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

**Answer: B**

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**62.** The value of the integral $\int_{-2}^{2} \frac{\sin^2 x}{-2\left[\frac{x}{\pi}\right]+\frac{1}{2}} dx$ (where [x] denotes the greatest integer less then or equal to x) is

A. $4$

B. $4-\sin 4$

C. $\sin 4$

D. $0$

**Answer: D**

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**63.** The integral $\int_1^e \left\{\left(\frac{x}{e}\right)^{2x} - \left(\frac{e}{x}\right)^{x}\right\} \log_e x \, dx$ is equal to

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

B. $\frac{3}{2} - \frac{1}{e} - \frac{1}{2e^2}$

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

D. $\frac{3}{2} - e - \frac{1}{2e^2}$

**Answer: D**

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**64.** Let f and g be continuous functions on [ 0 , a] such that $f(x) = f(x) = f(a - x)$ and $g(x) + g(a - x) = 4$, then $\int_0^a f(x)g(x)$ dx is equal to

A. $4\int_0^a f(x)dx$

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

C. $-3\int_0^a f(x)dx$

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

**Answer: B**

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**65.** The integral $\int_{\pi/6}^{\pi/4} \frac{dx}{\sin 2x\left(\tan^5 x + \cot^5 x\right)}$ equals

A. $\frac{1}{10}\left(\frac{\pi}{4} - \tan^{-1}\left(\frac{1}{9\sqrt{3}}\right)\right)$

B. $\frac{1}{5}\left(\frac{\pi}{4} - \tan^{-1}\left(\frac{1}{3\sqrt{3}}\right)\right)$

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

D. $\frac{1}{20}\tan^{-1}\left(\frac{1}{9\sqrt{3}}\right)$

**Answer: A**

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Questions From Previous Years B Architecture Entrance Examination Papers

**1.** 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. $0$

B. $-2$

C. $1$

D. $2$

**Answer: A**

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**2.** If $f$ is continuously differentiable function then $\int_0^{1.5} \left[x^2\right] f'(x)dx$ is

A. $f(1.5) - f\left(\sqrt{2}\right) - f(1)$

B. $f(1.5) + f\left(\sqrt{2}\right) + f(1)$

C. $2f(1.5) + f\left(\sqrt{2}\right) + f(1)$

D. $2f(1.5) - f\left(\sqrt{2}\right) - f(1)$

**Answer: D**

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**3.** $\int_{-a}^{a} \log\left(x + \sqrt{x^2+1}\right) dx$

A. $2\log\left(a^2+1\right)$

B. $2\log\left(\sqrt{a^2+1} - a\right)$

C. $0$

D. $2\log\left(a + \sqrt{a^2+1}\right)$

**Answer: C**

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**4.** If $f(x) = \frac{1}{2^n}$ when $\frac{1}{2^{n+1}} < x \leq \frac{1}{2^n}, n = 0, 1, 2\ldots$ then $\lim_{n \to \infty} \int_{t/2^n}^{1} f(x)dx$ equals

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

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

C. $0$

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

**Answer: B**

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**5.** The value of $\int_0^1 x^2(1-x)^9 dx$ is

A. $\frac{1}{610}$

B. $\frac{1}{630}$

C. $\frac{1}{640}$

D. $\frac{1}{660}$

**Answer: D**

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6. The value of $\int_0^1 \max\left(e^x, e^{1-x}\right) dx$ equals

A. $2(e-1)$

B. $2\left(e-\sqrt{e}\right)$

C. $2\left(e+\sqrt{e}\right)$

D. $2\left(e+\sqrt{e}\right)$

**Answer: B**

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7. $\int_0^{\pi/2} x \sin\cos x dx = ?$

A. $2\sqrt{2}$

B. $\sqrt{2}$

C. $2-\sqrt{2}$

D. $2+\sqrt{2}$

**Answer: C**

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**8.** Let $f: R \to R$ be defined by $f(x) = \int_0^1 \frac{x^2+t^2}{2-t} dt$. Then the curve $y = f(x)$ is

A. an ellipse

B. a straight line

C. a parabola

D. a hyperbola

**Answer: C**

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**9.** The equation of a curve is given by $y = f(x)$, where $f'(x)$ is a continuous function. The tangent at points $(1, f(1)), (2, f(2))$ and $(3, f(3))$ make angles $\frac{\pi}{6}, \frac{\pi}{3}$ and $\frac{\pi}{4}$ respectively with positive x-axis. Then $\int_2^3 f'(x)f''(x)dx + \int_1^3 f''(x)dx$ is

A. $1$

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

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

D. $0$

**Answer: B**

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**10.** Using the fact that $0 \leq f(x) \leq g(x), c < x < d \Rightarrow \int_c^d f(x)dx \leq \int_c^d g(x)dx$, we can conclude that $\int_1^3 \sqrt{3 + x^3}$ lies in the interval

A. $\left(\frac{1}{2}, 3\right)$

B. $\left(2, \sqrt{30}\right)$

C. $\left(\frac{3}{2}, 5\right)$

D. $\left(4, 2\sqrt{30}\right)$

**Answer: D**

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

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

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

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

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

**Answer: C**

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**12.** If $f(x) = x[x]$, then for any real number a and b with $a < b$, then value of $\int_a^b f(x)dx$ equals

A. $\frac{1}{3}\left(|b|^3 - |a|^3\right)$

B. $\frac{1}{3}\left|b^3 - a^3\right|$

C. $\frac{1}{3}\left(a^3 + b^3\right)$

D. $\frac{1}{3}\left(a^3 - b^3\right)$

**Answer: B**

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**13.** The integral $\int_{\sqrt{\log 5}}^{\sqrt{\log 7}} \frac{x\cos x^2}{\cos(\log 35 - x^2) + \cos x^2}dx$ is equal to

A. $\frac{1}{4}\frac{\log(5)}{7}$

B. $\frac{1}{2}\frac{\log(5)}{7}$

C. $\frac{1}{4}\frac{\log(7)}{5}$

D. $\frac{1}{2}\frac{\log(7)}{5}$

**Answer: C**

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**14.** If $f(x) = \frac{e^2}{1+e^x}$, $I_1 = \int_{f(-a)}^{f(a)} xg\{x(1-x)\}dx$ and $I_2 = \int_{f(-a)}^{f(a)} g\{x(1-x)\}dx$, where g is not identify function. Then the value of $I_2 / I_1$, is

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

B. $2$

C. $1$

D. $-$

**Answer: B**

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**15.** The integral $\int_0^{1/2} \frac{e^x(2-x^2)}{(1-x)^{3/2}(1+x)^{1/2}}dx$ is equal to

A. $\sqrt{3e}$

B. $\sqrt{3e}-1$

C. $\frac{\sqrt{e}}{3}$

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

**Answer: B**

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**16.** The integral $I=\int_0^2 [x^2]dx([x]$ denotes the greatest integer less than or equal to $x)$ is equal to:

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

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

C. $6-\sqrt{2}-\sqrt{3}$

D. $3-\sqrt{2}$

**Answer: B**

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**17.** The integral $\int_{\pi/24}^{5\pi/24} \frac{dx}{1+\sqrt[3]{\tan 2x}}$ is equal to

A. $\frac{\pi}{18}$

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

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

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

**Answer: C**

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**18.** If $f(x) = \int_e^{e^x} \log\left(\frac{x}{\log t}\right) dt$, then the value of $\frac{3f'(3)}{e}$

A. $-3\log 3$

B. $3\log 3$

C. $e^3 - e$

D. $e^2 - 1$

**Answer: D**

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