**1.** $\lim\limits_{x\to 0} \dfrac{\int_0^{x^2} (\tan^{-1} t)^2\, dt}{\int_0^{x^4} \sin\sqrt{t}\, dt}$ is equal to -

(a) 1 (b) -1 (c) -1/2 (d) 1/2

**2.** If $f(x) = \int_1^{x^3} \dfrac{dt}{1+t^4}$, then $f''(x)$ is equal to -

(a) $\dfrac{6x(1-5x^{12})}{(1+x^{12})^2}$

b) $\dfrac{6x(1+5x^{12})}{(1+x^{12})^2}$

(c) - $\dfrac{6x(1-5x^{12})}{(1+x^{12})^2}$

(d) None of these

**3.** Let $\dfrac{d}{dx} F(x) = \left(\dfrac{e^{\sin x}}{x}\right)$, $x > 0$ If $\int_1^4 \dfrac{3}{x} e^{\sin x^3} dx = F(k) - F(1)$, then one of the possible values of k is -

(a) 15 (b) 16 (c) 63 (d) 64

**4.** $\lim\limits_{n\to\infty} \left[\dfrac{1}{n} + \dfrac{n^2}{(n+1)^3} + \dfrac{n^2}{(n+2)^3} + \ldots + \dfrac{1}{8n}\right]$ is equal to -

(a) $\dfrac{3}{8}$ (b) $\dfrac{1}{4}$

(c) $\dfrac{1}{8}$ (d) None of these

**5.** If $S_n = \left[\dfrac{1}{2n} + \dfrac{1}{\sqrt{4n^2-1}} + \dfrac{1}{\sqrt{4n^2-4}} + \ldots + \dfrac{1}{\sqrt{3n^2+2n-1}}\right]$ then $\lim\limits_{n\to\infty} S_n$ is equal to -

(a) $\dfrac{\pi}{4}$ (b) $\dfrac{\pi}{6}$

(c) $\dfrac{\pi}{3}$ (d) $\dfrac{\pi}{2}$

**6.** $\int_{-100\pi}^{100\pi} (\sin^4 x + \cos^4 x) dx$ is equal to -

(a) 100 $\pi$ (b) 150 $\pi$ (c) 200 $\pi$ (d) None

**7.** In = $\int_0^{\pi/4} \tan^n x\, dx$, then $\lim\limits_{n\to\infty} n\,[I_n + I_{n+2}]$ equals -

(a) $\dfrac{1}{2}$ (b) 1

(c) $\infty$ (d) zero

**8.** $\int_0^{\pi} \dfrac{x^3 \cos^4 x \sin^2 x}{\pi^2 - 3\pi x + 3x^2} dx$ is equal to -

(a) $\dfrac{\pi^2}{16}$ (b) $\dfrac{\pi^2}{8}$

(c) $\dfrac{\pi^2}{4}$ (d) $\dfrac{\pi^2}{32}$

**9.** $\lim\limits_{n\to\infty} \left[\left(1+\dfrac{1^2}{n^2}\right)\left(1+\dfrac{2^2}{n^2}\right)\ldots\left(1+\dfrac{n^2}{n^2}\right)\right]^{1/n}$ is equal to -

(a) $2e^{\frac{\pi+4}{2}}$ (b) $e^{\frac{\pi+4}{2}}$

(c) $e^{\frac{\pi-4}{2}}$ (d) $2\,e^{\frac{\pi-4}{2}}$

**10.** The value of $\lim\limits_{m\to\infty} \dfrac{\int_0^{\pi/2} \sin^{2m} x dx}{\int_0^{\pi/2} \sin^{2m+1} x\, dx}$

(a) 0 (b) 1/2 (c) 2 (d) None of these

**11.** The $\lim\limits_{n\to\infty} S_n$ if

$S_n = \dfrac{1}{2n} + \dfrac{1}{\sqrt{4n^2-1}} + \dfrac{1}{\sqrt{4n^2-4}} + \ldots + \dfrac{1}{\sqrt{3n^2+2n-1}}$ is -

(a) $\pi/2$ (b) 2 (c) 1 (d) $\pi/6$

**12.** Find the limit, when $n \to \infty$ of $\dfrac{\sqrt{n}}{(3+4\sqrt{n})^2} + \dfrac{\sqrt{n}}{\sqrt{2}(3\sqrt{2}+4\sqrt{n})^2} + \dfrac{\sqrt{n}}{\sqrt{3}(3\sqrt{3}+4\sqrt{n})^2} + \ldots + \dfrac{1}{49n}$

(a) $\dfrac{1}{12}$ (b) $\dfrac{1}{13}$

(c) $\dfrac{1}{14}$ (d) None of these

**13.** Find the limit, when $n \to \infty$ of $\dfrac{(n!)^{1/n}}{n}$

(a) e (b) $\dfrac{1}{e^2}$

(c) $\dfrac{1}{e}$ (d) $e^2$

**14.** Evaluate : $\int_0^{\pi/2} \sin^9 x \cos^4 x\, dx$ -

(a) $\dfrac{128}{1515}$ (b) $\dfrac{128}{15015}$

(c) $\dfrac{64}{15015}$ (d) None of these

**15.** Show that : $\text{Lim}\limits_{n\to\infty} \sum_{r=0}^{n} \dfrac{{}^nC_r}{n^r(r+3)} = e - 2$

(a) e - 1 (b) 2 - e (c) e - 2 (d) None of these

**16.** For $f(x) = \int_0^1 e^{x^2} dx$

(a) $0 \le \int_0^1 e^{x^2} dx \le 1$

(b) $1 \le \int_0^1 e^{x^2} dx \le e^2$

(c) $1 \le \int_0^1 e^{x^2} dx \le e$

(d) $0 \le \int_0^1 e^{x^2} dx \le e^2$

**17.** If $I_1 = \int_e^{e^2} \frac{dx}{\log x}$ & $I_2 = \int_1^2 \frac{e^x}{x} dx$ then -

(a) $I_1 = I_2$ (b) $2I_1 = I_2$ (c) $I_1 = 2I_2$ (d) None

**18.** The value of $\int_{-2}^{2} \left\{ p\ell n\left(\frac{1+x}{1-x}\right) + q\ell n\left(\frac{1-x}{1+x}\right)^{-2} + r \right\} dx$

depends on -

(a) p (b) q (c) r (d) q & p

**19.** $I_{m,n} = \int_0^1 x^m (\ell nx)^n dx$

(a) $-\frac{n}{m} I_{m,n-1}$

(b) $-\frac{n}{m+1} I_{m,n-1}$

(c) $-\frac{n+1}{m} I_{m-1,n-1}$

(d) None of these

**20.** If $f(x) = \begin{vmatrix} x & \cos x & e^{x^2} \\ \sin x & x^2 & \sec x \\ \tan x & 1 & 2 \end{vmatrix}$ Then $\int_{-\pi/4}^{+\pi/4} f(x)dx =$

(a) 0 (b) 1 (c) 4 (d) None of these