# All Branches Hinglish

## Subject: Engineering Mathematics

DPP-01

## Chapter: Calculus

## Topic : Maxima & Minima, Integral Calculus, Limits

**1.** On the interval [0, 1] the function $x^{25}(1-x)^{75}$ takes its maximum value at

(a) 0 (b) 1/2
(c) 1 (d) 1/4

**2.** The product of minimum value of $x^x$ and maximum value of $\left(\frac{1}{x}\right)^x$ is

(a) $e$ (b) $e^{-1}$
(c) 1 (d) $e^2$

**3.** The minimum value of the function defined by $f(x) = \max(x, x+1, 2-x)$ is

(a) 0 (b) 1/2
(c) 1 (d) 3/2

**4.** The greatest and the least values of the function, $f(x) = 2 - \sqrt{1+2x+x^2}$, $x \in [-2, 1]$ are

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

**5.** The difference between the greatest and least values of the function $f(x) = \sin 2x - x$ on $[-\pi/2, \pi/2]$ is

(a) $\frac{\sqrt{3}+\sqrt{2}}{2}$ (b) $\frac{\sqrt{3}+\sqrt{2}}{2}+\frac{\pi}{6}$
(c) $\frac{\pi}{2}$ (d) $\pi$

**6.** If p and q are positive real numbers such that $p^2 + q^2 = 1$, then the maximum value of $(p + q)$ is

(a) 2 (b) $\frac{1}{2}$
(c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

**7.** If x is real, the maximum value of $\frac{3x^2+9x+17}{3x^2+9x+7}$ is

(a) 41 (b) 1
(c) 17/7 (d) 1/4

**8.** The maximum value $x^3 - 3x$ in the interval [0, 2] is

(a) 1 (b) 2
(c) 0 (d) –2

**9.** Minimum value of $\frac{1}{3\sin\theta - 4\cos\theta + 7}$ is

(a) $\frac{7}{12}$ (b) $\frac{5}{12}$
(c) $\frac{1}{12}$ (d) $\frac{1}{6}$

**10.** The number of values of $x$ where $f(x) = \cos x + \cos\sqrt{2}x$ attains its maximum value is

(a) 1 (b) 0
(c) 2 (d) infinite

**11.** The greatest value of $f(x) = (x+1)^{1/3} - (x-1)^{1/3}$ in [0, 1] is

(a) 1 (b) 2
(c) 3 (d) $2^{1/3}$

**12.** if $\int_1^x \frac{dt}{|t|\sqrt{t^2-1}} = \frac{\pi}{6}$, then x can be equal to

(a) $\frac{2}{\sqrt{3}}$ (b) $\sqrt{3}$
(c) 2 (d) None of these

**13.** if $f(x) = \begin{cases} x; & x < 1 \\ x-1; & x \geq 1 \end{cases}$, then $\int_0^2 x^2 f(x)dx$ is equal to

(a) 1 (b) 4/3
(c) 5/3 (d) 5/2

**14.** $\int_0^{\pi} |1+2\cos x|\, dx$ equal to :

(a) $2\pi/3$ (b) $\pi$

(c) 2 (d) $\frac{\pi}{3}+2\sqrt{3}$

**15.** The value of $\int_{-1}^{3} (|x-2|+[x])dx$ is equal to (where [*] denotes greatest integer function)

(a) 7 (b) 5

(c) 4 (d) 3

**16.** If $\int_{-1}^{3/2} |x\sin\pi x|dx = \frac{k}{\pi^2}$, then the value of k is

(a) $3\pi + 1$ (b) $2\pi + 1$

(c) 1 (d) 4

**17.** $\int_{\log\pi-\log 2}^{\log\pi} \frac{e^x}{1-\cos\left(\frac{2}{3}e^x\right)}$ dx is equal to

(a) $\sqrt{3}$ (b) $-\sqrt{3}$

(c) $\frac{1}{\sqrt{3}}$ (d) $-\frac{1}{\sqrt{3}}$

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

(a) $I_1 = I_2$ (b) $2\, I_1 = I_2$

(c) $I_1 = 2\, I_2$ (d) None of these

**19.** $\int_{2-\log 3}^{3+\log 3} \frac{\log(4+x)}{\log(4+x)+\log(9-x)}dx$

(a) Cannot be evaluated

(b) Is equal to 5/2

(c) is equal to 1+2 log 3

(d) Is equal to ½ + log 3

**20.** $\int_0^{\infty} [2e^{-x}]\, dx$ is equal to

(where [*] denotes the greatest integer function)

(a) 0 (b) ln 2

(c) $e^2$ (d) $2e^{-1}$

**21.** If $\int_0^{\infty} e^{-x^2}dx = \frac{\sqrt{x}}{2}$, then $\int_0^{\infty} e^{-ax^2}dx$ where a > 0 is

(a) $\frac{\sqrt{\pi}}{2}$ (b) $\frac{\sqrt{\pi}}{2a}$

(c) $2\frac{\sqrt{\pi}}{a}$ (d) $\frac{1}{2}\sqrt{\frac{\pi}{a}}$

**22.** The expression $\frac{\int_0^n [x]dx}{\int_0^n \{x\}dx}$ is equal to

(where [*] and {*} denotes greatest integer function and fractional part function and $n \in N$).

(a) $1/n - 1$ (b) $1/n$

(c) $n$ (d) $n - 1$

**23.** Let $A = \int_0^1 \frac{e^t dt}{1+t}dt$ then $\int_{a-1}^{a} \frac{e^{-t}}{t-a-1}$ dt has the value

(a) $Ae^{-a}$ (b) $-Ae^{-a}$

(c) $-ae^{-a}$ (d) $Ae^{a}$

**24.** $\int_0^{\pi} xf(\sin x)dx$ is equal to

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

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

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

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

**25.** Let f : R $\rightarrow$ R be a differentiable function having f(2) = 6, f '(2) = $\left(\frac{1}{48}\right)$. Then $\lim_{x\to 2} \int_6^{f(x)} \frac{4t^3}{x-2}$dt equals

(a) 18 (b) 12

(c) 36 (d) 24

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

(a) 0 (b) 1

(c) 2 (d) 3

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

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

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

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

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

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

(a) 3 (b) 2

(c) 1 (d) –1

**29.** $\int_{\sin x}^{1} t^2 f(t)dt = 1-\sin x \;\forall x\in(0,\pi/2)$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is

(a) 3 (b) $\sqrt{3}$

(c) 1/3 (d) None of these

**30.** $\lim_{x\to 0}\frac{\int_0^{x^2}\cos t^2 dt}{x\sin x}$ is equal to

(a) –1 (b) 1

(c) 2 (d) –2

**31.** If $\int_{\ln 2}^{x}\frac{dx}{\sqrt{e^x-1}}=\frac{\pi}{6}$, then x =

(a) 4

(b) ln 8

(c) ln 4

(d) None of these

**32.** $\underset{x\to\infty}{\text{Limit}}\left(\frac{x^2-2x+1}{x^2-4x+2}\right)^x =$

(a) 1 (b) 2

(c) $e^2$ (d) e

**33.** If α and β be the roots of $ax^2 + bx + c = 0$, then $\lim_{x\to\alpha}(1+ax^2+bx+c)^{\frac{1}{x-\alpha}}$ is

(a) $a(\alpha-\beta)$ (b) $\ln|a(\alpha-\beta)|$

(c) $e^{a(\alpha-\beta)}$ (d) $e^{a|\alpha-\beta|}$

**34.** $\lim_{x\to\pi/2}\frac{2^{-\cos x}-1}{x(x-\pi/2)} =$

(a) $\frac{2\ln 2}{\pi}$ (b) ln2

(c) $2/\pi$ (d) Does not exists

**35.** $\underset{x\to\pi/2}{\text{Limit}}\frac{\left(1-\tan\frac{x}{2}\right)(1-\sin x)}{\left(1+\tan\frac{x}{2}\right)(\pi-2x)^3}$ is

(a) 1/16 (b) –1/16

(c) 1/32 (d) –1/32

**36.** $\lim_{x\to 0}(\cos mx)^{n/x^2}$

(a) $e^{-m^2n/4}$ (b) $e^{-m^2n/2}$

(c) $e^{-mn^2/2}$ (d) $e^{-mn^2/4}$

**37.** $\underset{x\to 0}{\text{Limit}}\frac{(4^x-1)^3}{\sin\left(\frac{x}{p}\right)\ln\left(1+\frac{x^2}{3}\right)} =$

(a) 9 p (log 4) (b) 3 p $(\log 4)^3$

(c) 12 p $(\log 4)^3$ (d) 27 p $(\log 4)^2$

**38.** Evaluate

$$\underset{n\to\infty}{\text{Limit}}\left(\frac{1}{\sqrt{n^2}}+\frac{1}{\sqrt{n^2+1}}+\frac{1}{\sqrt{n^2+2}}+\ldots+\frac{1}{\sqrt{n^2+2n}}\right)$$

(a) 1 (b) 1/2

(c) 0 (d) 2

**39.** $\lim\limits_{x\to\infty}\left(\dfrac{x^2+5x+3}{x^2+x+3}\right)^x$ is equal to

(a) $e^4$ (b) $e^2$

(c) $e^3$ (d) e

**40.** Let α and β be the distinct roots of $ax^2 + bx + c = 0$,

Then $\lim\limits_{x\to\alpha}\dfrac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$ is equal to

(a) $\dfrac{1}{2}(\alpha-\beta)^2$ (b) $-\dfrac{a^2}{2}(\alpha-\beta)^2$

(c) 0 (d) $\dfrac{a^2}{2}(\alpha-\beta)^2$

**41.** $\lim\limits_{x\to0}\left(\cot\left(\dfrac{\pi}{4}+x\right)\right)^{\text{cosec}x}$ =

(a) $e^{-1}$ (b) $e^2$

(c) $e^{-2}$ (d) $e^1$

**42.** $\lim\limits_{x\to\infty}\left(\sin\dfrac{1}{x}+\cos\dfrac{1}{x}\right)^x$ is

(a) e (b) $e^2$

(c) 1/e (d) does not exist

**43.** $\lim\limits_{x\to\infty}\dfrac{\sin(6x^2)}{\ln\cos(2x^2-x)}$ =

(a) 12 (b) –12

(c) 6 (d) –6

**44.** $\lim\limits_{x\to0}\dfrac{e^{-x^2/2}-\cos x}{x^3\sin x}$ =

(a) 1/4 (b) 1/6

(c) 1/12 (d) 1/8

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# Answer Key

1. (d)
2. (c)
3. (d)
4. (c)
5. (d)
6. (d)
7. (a)
8. (b)
9. (c)
10. (a)
11. (b)
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13. (c)
14. (d)
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35. (c)
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37. (b)
38. (d)
39. (a)
40. (d)
41. (c)
42. (a)
43. (b)
44. (c)

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