NDA (MATHS) MOCK TEST - 37 (SOLUTION)

1. (B) $y = \ln(e^{mx} + e^{-mx})$

On differentiating it w.r.t.x, we get

$$\frac{dy}{dx} = \frac{1}{e^{mx}+e^{-mx}} \cdot \frac{d}{dx}(e^{mx} + e^{-mx})$$

$$= \frac{1}{e^{mx}+e^{-mx}}(me^{mx} - me^{-mx})$$

$$\therefore \left(\frac{dy}{dx}\right)_{at\,x=0} = m\left(\frac{1-1}{1+1}\right) = 0$$

2. (B) $f(x) = x^2 - x^{-2}$

$$f\left(\frac{1}{x}\right) = \frac{1}{x^2} - \left(\frac{1}{x}\right)-2$$

$$= \frac{1}{x^2} - \frac{1}{x^2}$$

$$= \frac{1}{x^2} - x^2$$

$= -(x^2 - x^{-2}) = -f(x)$

3. (C) We know that, in a GP the product of two terms equidistant from the beginning and end is a constant and is equal to the product of first term and last term, i.e., if $a_1, a_2, a_2, \ldots, a_{(n-2)}, a_{n-1}, a_n$ are in GP, then $a_1a_n = a_2a_{n-1} = a_3a_{n-2} = \ldots\ldots$

Given that,

$S_2S_u = S_pS_8 \Rightarrow (p + 8) = (2 + 11)$

4. (A) Remainder $\Rightarrow = 5$

$$\begin{aligned} 182 \div 2 &= 91 + 0 \\ 91 \div 2 &= 45 + 1 \\ 45 \div 2 &= 22 + 1 \\ 22 \div 2 &= 11 + 0 \\ 11 \div 2 &= 5 + 1 \\ 5 \div 2 &= 2 + 1 \\ 2 \div 2 &= 1 + 0 \\ &1 \end{aligned}$$

$\therefore (182)_{10} = (10110110)_2$

5. (B) $\begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix} = \frac{1}{abc}\begin{vmatrix} abc & a^2 & a^3 \\ abc & b^2 & b^3 \\ abc & c^2 & c^3 \end{vmatrix}$

$$\frac{abc}{abc}\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$$

6. (B) Radius of the circle = $\sqrt{2}$

$\therefore$ area of the circle = $\pi\left(\sqrt{2}\right)^2$

= 2π sq. units

7. (B) $\tan 105° = \tan(60° + 45°)$

$$= \frac{\tan 60° + \tan 45°}{1 - \tan 60°.\tan 45°}$$

$$\left[\because \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A.\tan B}\right]$$

$$= \frac{\sqrt{3}+1}{1-\sqrt{3}.1} = \frac{\sqrt{3}+1}{1-\sqrt{3}}$$

8. (B) Let $\alpha = \omega$ and $\beta = \omega^2$

Then, $xyz = (a + b)(a\omega + b\alpha^2)(a\omega^2 + b\omega)$

$= a^3 + b^3$

9. (C) $I = \int_0^{\pi/2} \frac{\sin 2\theta}{\cos 2\theta + \sin 2\theta}\, d\theta$

$$\text{also } I = \int \frac{\sin\left(\frac{\pi}{2} - 2\theta\right)}{\sin\left(\frac{\pi}{2} - 2\theta\right) + \cos\left(\frac{\theta}{2} - 2\theta\right)}$$

$$= \int_0^{\pi/2} \frac{\cos 2\theta}{\cos 2\theta + \sin 2\theta}\, d\theta$$

$$\text{Now } I + I = \int_0^{\pi/2} \frac{\sin 2\theta + \cos 2\theta}{\sin 2\theta + \cos 2\theta}\, d\theta$$

$$= \int_0^{\pi/2} 1\, d\theta$$

$$= [\theta]_0^{\pi/2} = \frac{\pi}{2} \Rightarrow I = \frac{\frac{\pi}{2}}{2} = \frac{\pi}{4}$$

10. (D) $\frac{dy}{dx} = 1 - e^x$ is positive. if $e^x < 1$.

$\Rightarrow x < 0 \Rightarrow x\ \forall\ (-\infty, 0)$

So, the interval $(-\infty, -1)$ is part of interval $(-\infty, 0)$.

11. (A) Factories both numerator and denominator.

$$\lim_{x \to \pi/4} \frac{(1-\cot x)(1+\cot x+\cot^2 x)}{(1-\cot x)(2+\cot x+\cot^2 x)}$$

$$= \frac{1+1+1}{2+1+1} = \frac{3}{4}$$

12. (B) $\because\ x^2 - 2x + \sin^2\theta = 0$

$\therefore\ x = \dfrac{2 \pm \sqrt{4 - 4\sin^2\theta}}{2}$

$\Rightarrow\ x = 1 \pm \cos\theta$

$\because\ -1 \le \cos\theta \le 1$

$\therefore\ 0 \le 1 \pm \cos\theta \le 2 \Rightarrow 0 \le \cos\theta \le 2 \Rightarrow x \in [0,2]$

13. (B) Requred probability = P (Indian wins first and third test) + P (India wins second and third test)

$= \dfrac{1}{2}\left(1-\dfrac{1}{2}\right)\left(\dfrac{1}{2}\right) + \left(1-\dfrac{1}{2}\right)\left(\dfrac{1}{2}\right)\left(\dfrac{1}{2}\right)$

$= \dfrac{1}{8} + \dfrac{1}{8} = \dfrac{1}{4}$

14. (C) 100101 + 101 is

$$\begin{array}{r} 100101 \\ +101 \\ \hline 101010 \\ \hline \end{array}$$

100101 + 101 + 1101 is

$$\begin{array}{r} 101010 \\ +1101 \\ \hline 110111 \\ \hline \end{array}$$

$\therefore$ 100101 + 101 + 1101 + 100 is

$$\begin{array}{r} 110111 \\ 100 \\ \hline 111011 \end{array}$$

15. (D) $f[f(x)] = f\left(\dfrac{\alpha x}{x+1}\right) = \dfrac{\alpha\left(\dfrac{\alpha x}{x+1}\right)}{\dfrac{\alpha x}{x+1}+1} = \dfrac{\alpha^2 x}{\alpha x + x + 1}$

$\because\ f[f(x)] = x$

$\therefore\ \dfrac{\alpha^2 x}{\alpha x + x + 1} = x \Rightarrow \alpha^2 x = \alpha x^2 + x^2 + x$

By inspection, we get a = – 1

16. (B)

17. (C) Applying $R_1 \to R_1 - R_2$ and $R_1 \to R_2 - R_3$ and take $(x-1)$ common from R_1 and R_2,

$$\Delta = (x-1)^2 \begin{vmatrix} x+1 & 1 & 0 \\ 2 & 1 & 0 \\ 3 & 3 & 1 \end{vmatrix} = (x-1)^3$$

$\therefore$ k = 3

18. (B) $y = Ae^{3x} + Be^{3x}$ .... (i)

$y_1 = 3Ae^{3x} + 5Be^{3x}$ .... (ii)

$y_2 = 9Ae^{3x} + 25Be^{3x}$ .... (iii)

Eliminating A and B from the above three equations, we get

$$\begin{vmatrix} e^{3x} & e^{5x} & -y \\ 3e^{3x} & 5e^{5x} & -y_1 \\ 9e^{3x} & 25e^{5x} & -y_2 \end{vmatrix} = 0 \Rightarrow -e^{3x} \times e^{5x}$$

$$\begin{vmatrix} 1 & 1 & y \\ 3 & 5 & y_1 \\ 9 & 25 & y_2 \end{vmatrix} = 0$$

Exapnding, we get $30y - 16y_1 + 2y_2 = 0$

of $\dfrac{d^2y}{dx^2} - 8\dfrac{dy}{dx} + 15\,y = 0$

19. (B) We know that,

$\tan\dfrac{A-B}{2} = \sqrt{\dfrac{1-\cos(A-B)}{1+\cos(A-B)}} = \sqrt{\dfrac{1-\dfrac{31}{32}}{1+\dfrac{31}{32}}}$

$= \dfrac{1}{\sqrt{63}} \Rightarrow \dfrac{a-b}{a+b}.\cot\dfrac{C}{2} = \dfrac{1}{\sqrt{63}}$

$\left(\because \tan\dfrac{A-B}{2} = \dfrac{a-b}{a+b}\cot\dfrac{C}{2}\right)$

$\Rightarrow\ \dfrac{1}{9}\cot\dfrac{C}{2} = \dfrac{1}{\sqrt{63}} \Rightarrow \tan\dfrac{C}{2} = \dfrac{\sqrt{7}}{3}$

Now, $\cos C = \dfrac{1-\tan^2\dfrac{C}{2}}{1+\tan^2\dfrac{C}{2}} = \dfrac{1-\dfrac{7}{9}}{1+\dfrac{7}{9}} = \dfrac{1}{8}$

20. (B) $\because\ c^2 = a^2 + b^2 - 2ab\cos C$

$\therefore\ c^2 = 25 + 16 - 40 \times \dfrac{1}{8} = 36 \Rightarrow c = 6$

21. (B) We know that, $\sin A = \dfrac{2\tan\dfrac{A}{2}}{1+\tan^2\dfrac{A}{2}}$

$\Rightarrow\ (\sin A)\tan^2\dfrac{A}{2} - 2\tan\dfrac{A}{2} + \sin A = 0$

$\Rightarrow\ \dfrac{2 \pm \sqrt{4-4\sin^2 A}}{2\sin A} = \dfrac{2 \pm 2\cos A}{2\sin A} = \dfrac{1 \pm \cos A}{\sin A}$

$\tan\dfrac{A}{2} = \dfrac{1 \pm \sqrt{1-\sin^2 A}}{\sin A}$

Eq. (i) gives two values of $\tan\dfrac{A}{2}$, when sin A is given but $(\sin A \neq 0)$

22. (D) R = [$x : x$ is a set of all children of a same father]
Reflexive Let p be the children of same father.
Hence, pRp is a reflexive.
Symmetry Let p and q be the children of same father.
So, q and p be the children of same father.
And q and p be the children of same father.
Hence, R is symmetric.
Transitive Let p and q be the children ofsame father. And q and r be the children of same father.
So,p and r be the children of same father R.
Hence, R is transitive.
Since, R have all three properties such that reflexive, symmetry and transitive, so R is an equivalence relation.

23. (B) $1 = \int \frac{x(1-x)}{\sqrt{(1-x^2)}}dx$

$= \int \frac{x}{\sqrt{(1-x^2)}}dx + \int \frac{-x^2}{\sqrt{(1-x^2)}}dx$

$= \frac{1}{2}\int \frac{2x}{\sqrt{(1-x^2)}}dx + \int \frac{1-x^2-1}{\sqrt{(1-x^2)}}dx$

$= -\frac{1}{2}\times 2\sqrt{(1-x^2)} + \int \sqrt{(1-x^2)}dx$

$-\int \frac{1}{\sqrt{(1-x^2)}}dx$

$= \left(\frac{x}{2}-1\right)\sqrt{1-x^2} - \frac{1}{2}\sin^{-1}x + C$

24. (D) Apply $C_1 + C_2$, thus making two zero in C_1 and expanding we get

$\Delta = (\omega^2 + 2\omega)\begin{vmatrix}\omega^2 & -\omega \\ \omega & -\omega^2\end{vmatrix}$

$= (-1+\omega)(-\omega^4+\omega^2)$ ($\because \omega^2+\omega = -1$)
$= (-1+\omega)(-\omega+\omega^2)$ ($\because \omega^3 = 1$)
$= \omega^2 - \omega^3 - 2\omega^2 = 1 + \omega - 2\omega^2$
$= -\omega^2 - 2\omega^2 = -3\omega^2$

25. (B) every element of A can be image to ten elements of the set.
$\therefore$ Total number of mapping = 10^{10}

26. (C)

27. (C) $\because y^2 = P(x)$ ...... (i)

$2y\frac{dy}{dx} = P'(x)$ ...... (ii)

and $2y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 = P''(x)$

$\Rightarrow 2y\frac{d^2y}{dx^2} = P''(x) - 2\left(\frac{dy}{dx}\right)^2$

$\Rightarrow 2y^3\frac{d^2y}{dx^2} = y^2P''(x) - 2\left(y\frac{dy}{dx}\right)^2$

$\Rightarrow 2y^3\frac{d^2y}{dx^2} = P(x)P''(x) - 2\left\{\frac{P'(x)}{2}\right\}^2$

[using Eqs. (i) and (ii)]

$\Rightarrow 2y^3\frac{d^2y}{dx^2} = P(x)P''(x) - \frac{1}{2}\{P''(x)\}^2$

$\Rightarrow 2\frac{d}{dx}\left\{y^3\frac{d^2y}{dx^2}\right\} = P(x)P''(x) + P'(x)P''(x)$

$-\frac{1}{2}\times 2'(x)P''(x)$

$= P(x)P''(x)$

28. (A)
29. (C)
30. (D) Suppose and number p is placed in envelope number q, then card number q must be placed in a wrong envelope.
Hence, at least two cards must be palced in wrong envelope if all of them are not kept in their corresponding envelops.
31. (C) We know that
$(AB)^n = A^nB^n$ is true only when AB = BA
32. (A)
33. (A) By cosine rule,

$\cos A = \frac{b^2+c^2-a^2}{2bc}$

$\cos 60 = \frac{(3)^2+c^2-(4)^2}{2\times3\times c}$

$\Rightarrow \frac{1}{2} = \frac{9+c^2-16}{2\times3\times c}$

$\Rightarrow 3c = c^2 - 7 = c^2 - 3c - 7 = 0$

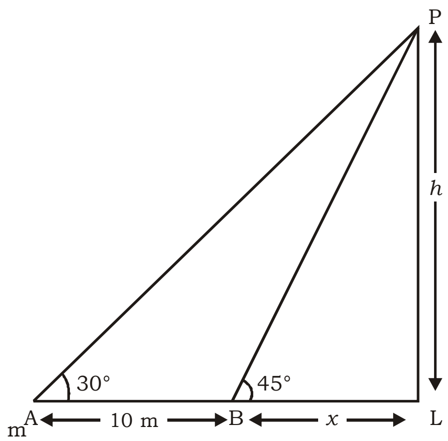
34. (C)
35. (A) Given, $z = 1 + i\tan\alpha$, where $\pi < \alpha < \frac{3\pi}{2}$.

$\Rightarrow |z| = \sqrt{1+tan^2\alpha} \Rightarrow |z| = \sqrt{\sec^2\alpha}$

α $\left(\because \pi < \alpha < \frac{3\pi}{2}\right)$

36. (B) Given that,
$(x+1)^2 - 1 = 0$
$\Rightarrow (x+1)^2 - (1)^2 = 0$
$\Rightarrow (x+1+1)(x+1-1) = 0$
[$\because a^2 - b^2 = (a-b)(a+b)$]
$\Rightarrow (x+2)(x) = 0$
$\therefore x = 0, -2$
Hence, $(x+1)^2 - 1 = 0$ has two real roots.

37. (D)
38. (A)
39. (B) Let BL = x m and PL = h m



In Δ PBL

$$\tan 45° = \frac{h}{x} = 1$$

Now, in Δ PAL,

$$\tan 30° = \frac{h}{10+x} = \frac{1}{\sqrt{3}} \Rightarrow \sqrt{3}\ h = 10 + x$$

$\Rightarrow \sqrt{3}$ h = 10 + h

$\Rightarrow (\sqrt{3}-1)$h = 10

$$\therefore\ h = \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{10\left(\sqrt{3}+1\right)}{3-1} = \frac{10\left(\sqrt{3}+1\right)}{2}$$

$= 5(\sqrt{3} + 1) = (5\sqrt{3} + 5)$ m

40. (b) $\because\ \Delta\Delta' = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \begin{vmatrix} A_1 & B_1 & C_1 \\ A_2 & B_2 & C_2 \\ A_3 & B_3 & C_3 \end{vmatrix}$

$$= \begin{vmatrix} \Sigma a_1A_1 & 0 & 0 \\ 0 & \Sigma a_2A_2 & 0 \\ 0 & 0 & \Sigma a_3A_3 \end{vmatrix} = \begin{vmatrix} \Delta & 0 & 0 \\ 0 & \Delta & 0 \\ 0 & 0 & \Delta \end{vmatrix} = \Delta^3$$

$\therefore\ \Delta' = \Delta^2$

41. (B) $y = \tan^{-1}\left(\frac{\sin x}{1+\cos x}\right) = \tan^{-1}\left[\frac{2\sin\frac{x}{2}\cos\frac{x}{2}}{1+2\cos^2\frac{x}{2}-1}\right]$

$$= \tan^{-1}\left(\tan\frac{x}{2}\right)$$

$$\Rightarrow\ y = \frac{x}{2} \Rightarrow \frac{dy}{dx} = \frac{1}{2}$$

42. (C) If r is radius of the circle, then $\pi r^2 = 154$

$\therefore\ r^2 = \frac{154 \times 7}{22} = 49$ $\left(\text{taking } \pi = \frac{22}{7}\right)$

$\Rightarrow$ r = 7

Also, solving the equations of two given diameters, we get the coordinates of the centre as (1, – 1).

Hence, the equation of the circle is

$(x - 1)^2 + (y + 1)^2 = 7^2 = 49$

$\Rightarrow x^2 + y^2 - 2x + 2y = 47$

43. (C) Given that, (α,β) are the roots of the equation $x^2 + x + 2 = 0$, then

$\alpha + \beta = -1$ ..... (i)

and $\alpha . \beta = 2$ ..... (ii)

Now, we have $\frac{\alpha^{10}+\beta^{10}}{\alpha^{-10}+\beta^{-10}} = (\alpha\beta)^{10} = (2)^{10}$

[from eq. (ii)]

= 1024

44. (A) The number of diagonals which can be drawn by joining the angular points of a polygon of 100 sides = ${}^{100}C_2 - 100$

$$= \frac{100!}{2!\,98!} - 100 = \frac{100 \times 99 \times 98!}{2 \times 98!} - 100$$

= 50 × 99 – 100 = 4950 – 100

= 4850

45. (A) of centroid

$$= \left\{\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right\}$$

$$= \left\{\frac{2\left(x_1+x_2+x_3\right)}{6}, \frac{2\left(y_1+y_2+y_3\right)}{6}\right\}$$

$$\left\{\frac{x_1+x_2+x_2+x_3+x_3+x_1}{6}, \frac{y_1+y_2+y_2+y_3+y_3+y_1}{6}\right\}$$

$$= \left\{\frac{\frac{x_1+x_2}{2}+\frac{x_2+x_3}{2}+\frac{x_3+x_1}{2}}{3}, \frac{\frac{y_1+y_2}{2}+\frac{y_2+y_3}{2}+\frac{y_3+y_1}{2}}{3}\right\}$$

$$= \left\{\frac{4+3+2}{3}, \frac{2+3+2}{3}\right\} = \left(3, \frac{7}{3}\right)$$

46. (A)
47. (C) $\because f(x) = kx^3 - 9x^2 + 9x + 3$

On differentiating w.r.t.x, we get

$f'(x) = 3kx^2 - 18x + 9$

For a function to be monotonically increasing .

$\Delta = b^2 - 4ac < 0$

$\Rightarrow 36 - 12k < 0 \Rightarrow k > 3$

48. (B) $3e^x \tan y\, dx + (1 + e^x) \sec^2 y\, dy = 0$

$$\Rightarrow \int \frac{3e^x}{1+e^x}\, dx + \int \frac{\sec^2 y}{\tan y}\, dy = 0$$

$\Rightarrow$ 3 log(1 + e^x) + log tan y = log C
$\Rightarrow$ log $(1 + e^x)^3$ tan y = log C
$(1 + e^x)^3$ tan y = C

49. (C) Given equation of parabola can be rewritten as $(x + 3)^2 = -\frac{2}{5}$ (y + 7) or $X^2 = 4AY$

$4A = -\frac{2}{5}$

$A = -\frac{1}{10}$

Focus is x = O, Y = A

or $x + 3 = O, y + 7 = -\frac{1}{10}$

$\therefore \left(-3, -\frac{71}{10}\right)$

50. (*) Middle term = $\frac{4}{2}$ + 1 =3rd
Coefficient of T_3 = Coefficient of T_{2+1}
$= {}^4C_2\ 2^2 \times 3^2 = 360$

51. (C) $x + y = 20$ and $z = xy^3$ is maximum
$z = y^3(20 - y) = 20y^3 - y^4$

$\frac{dz}{dy} = 60y^2 - 4y^3 = 0$

$\therefore$ $4y^2(15 - y) = 0$
$\therefore$ y = 0, 15

Now, $\frac{d^2z}{dy^2} = 120y - 12y^2 = 12y(10 - y)$

At y = 15, $\frac{d^2z}{dy^2} = 12 \times 15(10 - 15) < 0$

$\therefore$ Two parts are (15, 5)

52. (A) log tan 89° = log cot 1° = – log tan 1°
$\therefore$ Given expression becomes
log tan 1° + log tan 2° + ... + log tan44°+ log tan 45° – log tan44° – ....– log tan2° – log tan1° = log tan 45° = log 1 = 0

53. (A) Let $1 = \int_0^a x f(x) dx$ ...... (i)
By using property,

$\int_0^a f(x) dx = \int_0^a f(a - x) dx$

$\therefore$ $I = \int_0^a (a - x) f(a - x)\, dx$

$= \int_0^a (a - x) f(x)\, dx$ .... (ii)

On adding Eqs. (i) and (ii), we get

$2I = a \int_0^a f(x) dx \Rightarrow I = \frac{a}{2} \int_0^a f(x)\, dx$

54. (D) Total number of numbers in a factory
= worker + owner = 9 + 1 = 10
Now, the total daily income of workers of a factory including that of the owner = 110 × 10 = 1100 and the total dialy income of workers of a factory excludin that of the Hence, the daily income of the owner = (10 – 1) × 76 = 9 × 76 = 684
Hence, the daily income of the owner
= ₹ (1100 – 684) = ₹ 416

55. (A) $1 - \cos A = 2\sin^2\left(\frac{A}{2}\right)$

$1 + \cos A = 2\cos^2\left(\frac{A}{2}\right)$

Applying componendo and dividendo rule.

$\frac{1 - \cos\theta}{1 + \cos\theta} = \frac{a(1 - \cos\phi) - b(1 - \cos\phi)}{a(1 + \cos\phi) + b(1 + \cos\phi)}$

$\Rightarrow \tan^2\frac{\theta}{2} = \frac{a - b}{a + b}\tan^2\frac{\phi}{2}$

$\therefore \tan\frac{\theta}{2} = \sqrt{\frac{a - b}{a + b}}\ \tan\frac{\phi}{2}$

56. (D) $\left(\frac{1 + 2i}{2 + i} \times \frac{2 - i}{2 - 1}\right)^2 = \left(\frac{2 - i + 4 - 2i^2}{5}\right)^2$

$\left(\frac{4 + 3i}{5}\right)^2$

$\frac{16 - 9 + 24i}{25} = \frac{7 + 24i}{25}$

Conjutgate = $\frac{7}{25} - \frac{24}{5}$

57. (B) Selection of 3 points from given14 points can be made in ${}^{14}C_3 = 364$ .... (i)
But selection of 3 points from the points on one line cannot give any triagnle. Such selections are
${}^3C_3 + {}^5C_3 + {}^6C_3 = 1 + 10 + 20 = 31$ ...... (ii)
Hence, total number of triangle that can be formed = 364 – 31 = 333

58. (A)

59. (C) Arrangement is × M × C × T ×, first we place 3 consonant in 3! ways and then 3 vowels. At four '×' places (2 between them and 2 on sides) in which on vowel E is repeated can be placed in ${}^4P_3/\ 2!$ ways.
Hence, required number = 3. ${}^4P_3/\ 2! = 72$

60. (B) Here, P(A) = p, P(B) = q, $P(\bar{A}) = 1 - p$, $P(\bar{B})$ = 1–q
The probability that one person is alive

= P (A dies and B lives) + P(B dies and A lives)
= p (1 – q) + q (1 – p)
= p – pq + q – qp = p + q – 2 pq

61. (A) $\frac{dy}{dx} = \frac{y^2 - y - 2}{x^3 + 2x - 3} \Rightarrow \frac{dy}{y^2 - y - 2}$

$= \frac{dx}{x^2 + 2x - 3}$

$\Rightarrow \frac{1}{3}\left[\frac{1}{(y-2)} - \frac{1}{(y+1)}\right]dy$

$= \frac{1}{4}\left[\frac{1}{(x-1)} - \frac{1}{(x+3)}\right]dx$

$\therefore \frac{1}{3}\log\left|\frac{y-2}{y+1}\right| = \frac{1}{4}\log\left|\frac{x-1}{x+3}\right| + C$

62. (C) Let r = xi + yj + z k, then
r × a = b × a ⇒ (r – b) × a = 0
∴ z = – 1, x – y = 2
and r × b = a × b ⇒ (r – a) × b = 0
∴ y = 1, x + 2z = 1
∴ x = 3, y = 1 and z = – 1
∴ r = 3i + j – k

63. (D) According to the question,

$1400 = \frac{28 \times 1400}{100} + \frac{35 \times 1400}{100}$

$+ \frac{12 \times 1400}{100} + \frac{8 \times 1400}{100}$ + 105 + Transport

⇒ 1400 = 392 + 490 + 168 + 112 + 105 + Transport
∴ Transport = ₹ 133 crores

64. (D) Given, $\frac{dr}{dt}$ = 3 cm/s
Since, area of circle (A) = πr^2
On differentiating it w.r.t.t, we get

$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} = 2\pi \times 10 \times 3$ (∵ r = 10 cm)
= 60 π cm²/s

65. (D) $\frac{1+2i}{1-(1+i^2-2i)} = \frac{1+2i}{1-1+1+2i} = \frac{1+2i}{1+2i} = 1$

$\left|\frac{1+2i}{1-(1-i)^2}\right| = |1| = 1$

66. (D) ∴ A = Event of getting an even sum
= [(1, 1), (1, 3), (3, 1), (2, 2), (1, 5), (5, 1), (2,), (4, 2), (4, 2), (3, 3), (2, 6), (6, 2), (3, 5), (5, 3), (4, 4), (4, 6), (6, 4), (5, 5), (6, 6)]
and B = Event of getting sum less than 5
= {(1, 1), (2, 1), (1, 2), (1, 3), (3, 1), (2, 2)
A ∩ B = {(1, 1), (1, 3), (3, 1), (2, 2)}
P (A ∪ B) = P(A) + P(B) – P(A ∩ B)

$= \frac{18}{36} + \frac{6}{36} - \frac{4}{36} = \frac{5}{9}$

67. (*)

68. (A) y = $\tan^{-1} x - x$
On differentiating w.r.t.x, we get

$\frac{dy}{dx} = \frac{1}{1+x^2} - 1 = \frac{-x^2}{1+x^2}$

$\because \frac{dy}{dx} < 0, \forall \in R$
Hence, y is a decreasing function

69. (C) let I = $\int a^x e^x \, dx$

$= a^x \int e^x \, dx - \int \left(\frac{d}{dx}(a^x) \int e^x dx\right) dx$

$= a^x e^x - \int a^x \log a \, e^x dx$

$a^x e^x - \log a \int a^x e^x \, dx$

$a^x e^x - \log a \times I$

$(1 + \log a) I = a^x e^x$

$I = \frac{a^x e^x}{1 + \log a} = \frac{a^x e^x}{\log ae}$

70. (D) n = 9, d = $-\frac{1}{6}$, a = $\frac{1}{2} \Rightarrow S_n = \frac{3}{2}$

71. (D) Given $(1, 3, 2)_{1\times3} \begin{pmatrix} 1 & 3 & 0 \\ 3 & 0 & 2 \\ 2 & 0 & 1 \end{pmatrix}_{3\times3} \begin{pmatrix} 0 \\ 3 \\ x \end{pmatrix}_{3\times1} = (0)_{1\times1}$

$\Rightarrow (1 + 9 + 4 \quad 3 + 0 + 0 \quad 0 + 6 + 2)_{1\times3} \begin{pmatrix} 0 \\ 3 \\ x \end{pmatrix}_{3\times1}$

$= (0)_{1\times1}$

$\Rightarrow (14 \; 3 \; 8) \begin{pmatrix} 0 \\ 3 \\ x \end{pmatrix}_{3\times1} = 0_{1\times1}$

⇒ (0 + 9 + 8x) = (0) ⇒ (8x + 9) = 0
On comparing,

$8x + 9 = 0 \Rightarrow x = -\frac{9}{8}$

72. (A) $\frac{dy}{dx} = -\frac{1}{1+\cos 2x} \cdot \frac{1}{2\sqrt{(\cos 2x)}}(-2\sin 2x)$

Now, put $\pi = \frac{\pi}{6}$, $\cos 2x = \frac{1}{2}$ and $\sin 2x = \frac{\sqrt{3}}{2}$

$\therefore \left(\frac{dy}{dx}\right)_{x=\frac{\pi}{3}} = -\frac{1}{\left(1+\frac{1}{2}\right)} \cdot \frac{1}{2\sqrt{\frac{1}{2}}}(-2)\sqrt{\frac{3}{2}} = \sqrt{\frac{2}{3}}$

73. (B) Given differential equation is

$\log\left(\frac{dy}{dx}\right) + x = 0$

$\Rightarrow \log\left(\frac{dy}{dx}\right) = -x \Rightarrow \frac{dy}{dx} = e^{-x}$

On integrating both sides, we get

$y = -e^{-x} + C$

Which is the required general solution.

74. (B) Breaking the given integral into partial fractions, we get

$\frac{1}{(x-2)^2(x-3)} = \frac{1}{(x-2)^2} - \frac{1}{x-2} + \frac{1}{x-3}$

$\therefore \int \frac{dx}{(x-2)^2(x-3)} = -\int (x-2)^{-2}dx$

$-\int \frac{dx}{x-2} + \int \frac{dx}{x-3}$

$= -\frac{(x-2)^{-1}}{-1} - \log(x-2) + \log(x-3) + C_3$

$= \frac{1}{x-2} - \log\frac{x-2}{x-3} + C_3$

$\therefore C_1 = 1, C_2 = -1$

75. (A) $\therefore 2^x + 3^y = 17$ .... (i)

and $2^{x+2} - 3^{y+1} = 5$ .... (ii)

$\Rightarrow 4\cdot 2^x - 3\cdot 3^y = 5$

Solving Eqs. (i) and (ii).

$2^x = 8$ and $3^y = 9$

$\Rightarrow x = 3$ and $y = 2$

76. (D) Let a GP series is a, ar, ar^2,....

where, a = First term and r = Common ratio

Sum of infinite series (S) = $\frac{a}{1-r}$

or $6 = \frac{a}{(1-r)}$ or a = 6 (1 – r)

Sum of first two term (S_2) = a + ar

or $\frac{9}{2}$ = a (1 + r)

by Eq. (i), put the value of a

$\frac{9}{2} = 6(1-r)(1+r)$ or $\frac{3}{4} = 1 - r^2$

or $r = +\frac{1}{2}$

Case I if r = 1/2, then $a = 6\left(1-\frac{1}{2}\right)$ or a = 3

Case II if r = – 1/2, then $a = 6\left(1+\frac{1}{2}\right)$ or a = 3 ×3 = 9

77. (C)

78.(C) $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 4A}}} =$

$\sqrt{2+\sqrt{2+\sqrt{2(1+\cos 4A)}}}$

$= \sqrt{2+\sqrt{2+2\cos 2A}} = \sqrt{2(1+\cos A)} = 2\cos\frac{A}{2}$

79. (D) Given that is $x = a + bt - ct^2$ and $y = at + bt^2$

Acceleration in x direction = $\frac{d^2x}{dt^2} = -2c$

and acceleration in y direction = $\frac{d^2x}{dt^2} = 2b$

$\therefore$ Resultant acceleration

$= \sqrt{\left(\frac{d^2x}{dt^2}\right)^2\left(\frac{d^2y}{dt^2}\right)^2} = \sqrt{(-2c)^2 + (2b)^2}$

$= 2\sqrt{b^2+c^2}$

80. (C) Given, thedistance between the points (7, 1, – 3) and (4, 5, λ) = 13

$\Rightarrow \sqrt{(4-7)^2+(5-1)^2+(\lambda+3)^2} = 13$

$\Rightarrow \sqrt{(-3)^2+(-4)^2+(\lambda+3)^2} = 13$

$\Rightarrow \sqrt{9+16+(\lambda+3)^2} = 13$

$\Rightarrow \sqrt{25+(\lambda+3)^2} = 13$

On squaring both sides, we get

$25 + (\lambda + 3)^2 = 169$

$\Rightarrow 25 + \lambda^2 + 9 + 6\lambda - 169 = 0$

$\Rightarrow \lambda^2 + 6\lambda - 135 = 0$

$\Rightarrow \lambda^2 + 15\lambda - 9\lambda - 135 = 0$

$\Rightarrow \lambda(\lambda + 15) - 9(\lambda + 15) = 0$

$\Rightarrow (\lambda + 15)(\lambda - 9) = 0$

$\lambda = 9, -15$

81. (A) $\lim_{x\to 0}\frac{1-\cos 2x}{x} = \lim_{x\to 0}\frac{2\sin^2 x}{x}$

$= \lim_{x\to 0} 2\left(\frac{\sin x}{x}\right)^2 x = 2\cdot 1\cdot 0 = 0$

82. (C) The coefficients of three successive terms are ${}^nC_{r-1}$, ${}^nC_r$, ${}^nC_{r+1}$.

$$\Rightarrow \frac{{}^nC_{r-1}}{{}^nC_r} = \frac{1}{7} \text{ and } \frac{{}^nC_{r-1}}{{}^nC_{r+1}} = \frac{7}{42} = \frac{1}{6}$$

Simplifying $\frac{r}{n-r+1} = \frac{1}{7}$ and $\frac{r+1}{n-r} = \frac{1}{6}$

$\Rightarrow$ n – 8r = –1 and n – 7r = 6

Solving n = 55

83. (B) The centre and radius of circle $(x-\alpha)^2 + (y-\beta)^2 = 9$ are (α,β) and 3, respectively.

Since, (α,β) lies on the straight line $y = x$

$\therefore$ $\alpha = \beta$

Now, the circle touches the circle $x^2 + y^2 = 1$ externally.

$\alpha^2 + \beta^2 = 3 + 1 \Rightarrow \alpha^2 + \beta^2 = 4$

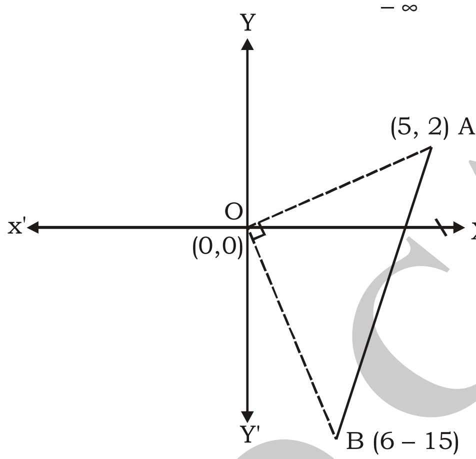
$\Rightarrow 2\alpha^2 = 4$

$\Rightarrow \alpha = \pm\sqrt{2}$

$\Rightarrow \alpha = \pm\sqrt{2}$ and $\beta = \pm\sqrt{2}$

– ∞

84. (C)



Slope of A = $\frac{2}{5}$

Slope of A = $\frac{-15}{6} = \frac{-5}{2}$

$\because m_1 \cdot m_2 = \frac{2}{5} \times \frac{-5}{2} = -1$

i.e, angle between OA and OB is $\pi/2$.

Hence, the line segment AB substend right angle at origin O.

85. (C) Any point on the given line is (5r – 3, 2r + 1. 3r – 4). If it is the foot of the perpendicular from (0, 2, 3), then 5 (5r– 3 –0) + 2(2r + 1 – 2) + 3(3r– 4 – 3) = 0

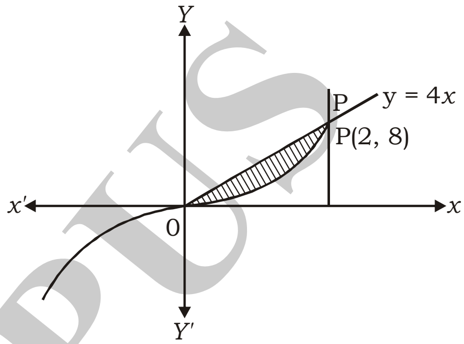
$\Rightarrow$ 38r = 38 $\Rightarrow$ r = 1

So, foot the perpendicualr is (2, 3, – 1)

86. (C) $y = x^3$ is a curve known as semi-cubical parabola. If $x \to -x$ and $y \to -y$ the equation does not change. It is symmetrical in Ist and IIIrd quadrants. The line $y = 4x$ meets is at $4x = x^3$

$\therefore$ $x = 0, 2, -2 \Rightarrow y = 0, 8, -8$

$\therefore$ Area in Ist quadrant = $\int_0^2 (y_1 - y_2)\,dx$



$$A = \int_0^2 (4x - x^3)\,dx$$

$$= \left[2x^2 - \frac{x^4}{4}\right]_0^2 = 4$$

87. (C) Statement I A matrix is only an arrangement of numbers, it has no definite value.

e.g., [7] ≠ 7

Statement II Let $\Delta_1 = \begin{vmatrix} 1 & 2 & 3 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{vmatrix}_{3\times3} = (2-3) = -3$

and $\Delta_2 = \begin{vmatrix} 1 & 3 \\ 2 & 3 \end{vmatrix}_{2\times2} = 3 - 6 = -3$

Hence, two determinants of different orders may have the same value.

88. (A) $f(x) = x\left(\frac{a^x - 1}{a^x + 1}\right)$

Put $x = -x$, we get

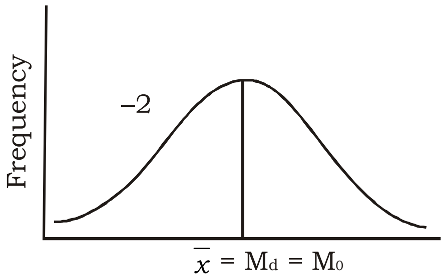
$$f(-x) = (-x)\left(\frac{a^{-x} - 1}{a^{-x} + 1}\right)$$

$$= -(x)\left(\frac{\frac{1-a^x}{a^x}}{\frac{1+a^x}{a^x}}\right) = (-x)\left(\frac{1-a^x}{1+a^x}\right)$$

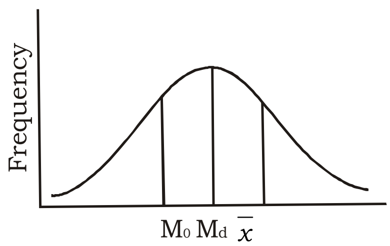
$$= x\left(\frac{a^x - 1}{a^x + 1}\right) = f(x)$$

So, $f(x)$ is an even function.

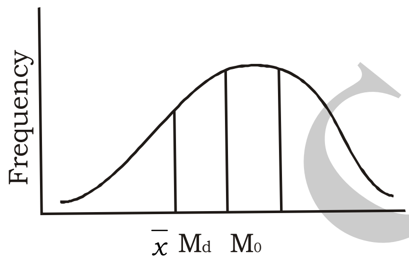
89. (D) frequency curve may be symmetrical, positive skew and negative skew.
For symmetry $\Rightarrow$ Mean = Median = Mode
$\Rightarrow \bar{x} = M_d = M_0$



For positive skew, Mean > Median > Mode



For negative skew, Mean < Median < Mode



90. (B) $\because$ S = $4\pi r^2$

$\Rightarrow \frac{dS}{dt} = \frac{8\pi r dr}{dt}$ and V = $\frac{4}{3}\pi r^3$

$\Rightarrow \frac{dV}{dt} = \frac{4}{3}\pi \cdot 3r^2 \frac{dr}{dt} = 4\pi r^2 \frac{dr}{dt} = \frac{4\pi r^2}{8\pi r} \cdot \frac{dS}{dt}$

$= \frac{1}{2} r \cdot \frac{dS}{dt}$

91. (B) First we arrnage the given data in ascending order, we get 3, 6, 6, 7, 7, 7, 8, 9, 9, 10,10, 10, 12
Total terms, n = 13 (odd)

$\therefore$ Median = $\left(\frac{n+1}{2}\right)$th term

$= \left(\frac{13+1}{2}\right)$th therm = 7th term = 8

92. (A) Given equations.
$8x - 9y = 20$ ...... (i)
and $7x - 10y = 9$ ...... (ii)

On multiplying Eq. (i) by 10 and Eq. (ii) by 9 and then subtracting Eq. (ii) from Eq. (i), we get

$$\begin{array}{r} 80x - 90y = 200 \\ 63x - 90y = 81 \\ - \quad + \quad\quad - \\ \hline 17x = 119 \end{array} \Rightarrow x = 7$$

and 10y = 7(7) – 9 = 49 – 9
$\Rightarrow$ 10 y = 40
$\Rightarrow$ y = 4
$\therefore$ $2x - y = 2(7) - 4 = 14 - 4 = 10$

93. (A) Let I = $\int (x\cos x + \sin x)\, dx$

$= \int \underset{I}{x}\underset{II}{\cos} dx + \int \sin x\, dx$

$= (x\sin x - \int \sin x\, dx) + \int \sin x\, dx = x\sin x + C$

94. (C) Given, $\frac{1}{\sin x}\frac{d^2y}{dx^2} = \operatorname{cosec} x - 2\sin x$

$\Rightarrow \frac{d^2y}{dx^2} = 1 - 2\sin^2 x = \cos 2x$

On integrating both sides w.r.t.x, we get

$\frac{dy}{dx} = \frac{\sin 2x}{2} + C_1$

Now, again integrating both sides w.r.t.x, we get $y = -\frac{\cos 2x}{4} + C_1 x + C_2$

95. (B) Here, n(S) = 52,
n (E_1) = 1, n(E_2) = 1, n$(E_1 \cap E_2) = \phi$
$\therefore$ $(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$

$= \frac{1}{52} + \frac{1}{52} - 0 = \frac{1}{26}$

96. (A) Given, $(2x + 3y + 4) + \lambda(6x - y + 12) = 0$
$2x + 6\lambda x + 3y - \lambda y + 4 + 12\lambda = 0$
$2x(3\lambda + 1) + y(3 - \lambda) + 4 + 12\lambda = 0$
Since, line (i) is parallel to Y-axis,
So, the coefficient of y must be zero.
$\therefore$ $3 - \lambda = 0 \Rightarrow \lambda = 3$

97. (B) let α be a root of $x^2 - x + k = 0$. The, 2α is a root of
$x^2 - x + 3k = 0$
$\therefore$ $4\alpha^2 - 2\alpha + 3k = 0$ and $\alpha^2 - \alpha + k = 0$

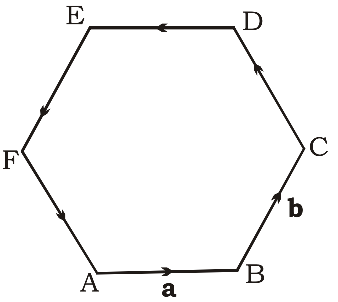
$\Rightarrow \frac{\alpha^2}{-2k+3k} = \frac{\alpha}{3k-4k} = \frac{1}{-4+2}$

$\Rightarrow\ \alpha^2 = -\dfrac{k}{2}$ and $\alpha = \dfrac{k}{2}$

Now, $\alpha^2 = (\alpha)^2 = \Rightarrow \left(-\dfrac{k}{2}\right) = \left(\dfrac{k}{2}\right)^2$

$\Rightarrow\ k^2 + 2k = 0 \Rightarrow k = 0$ or -2

98. (B)



AC = AB + BC = a + b
AD = 2BC = 2b
$\therefore$ FA = DC = AC – AD

99. (A) $\int \sec^n x\ \tan x\, dx$

$= \int \sec^{n-1}x\ .\sec x \tan x\, dx$

$= \dfrac{(\sec)^{n-1+1}}{n-1+1} = \dfrac{1}{n}\sec^n x + c$

100. (A) $\dfrac{\frac{1}{3}\log_2 17}{\frac{1}{2}\log_3 23} - \dfrac{\frac{2}{3}\log_2 17}{\log_3 23} = 0$

$\Rightarrow \dfrac{\frac{2}{3}\log_2 17}{\log_3 23} - \dfrac{\frac{2}{3}\log_2 17}{\log_3 23} = 0$

101. (D) Given, 2a = 3(2b)

$\therefore\ \dfrac{b^2}{a^2} = \dfrac{1}{9}$

$\Rightarrow c^2 = \sqrt{1-\dfrac{b^2}{a^2}} = \sqrt{1-\dfrac{b^2}{9b^2}} = \sqrt{\dfrac{8}{9}}$

$\therefore\ e = \dfrac{2\sqrt{2}}{3}$

102. (B) We know that two matrices A and B are defined for addition, if they are of the same type, Thus, if A be m × n, then B should also be m × n order. Again, since AB is also defined therefore number of columns in A i.e, n should be equal to number of rows in B i.e, m. Hence, n = m and in that case both A and B will be square matrices of order equal to m = n.

103. (C) $y = \sin^{-1}\dfrac{4x}{1+4x^2} = \sin^{-1}\dfrac{2\tan\theta}{1+\tan^2\theta}$, where
$\tan\theta = 2x$
$\sin^{-1}\sin 2\theta$
$= 2\theta$
$= 2\tan^{-1} 2x$

$\dfrac{dy}{dx} = \dfrac{2}{1+(2x)^2}\times 2 = \dfrac{4}{1+4x^2}$

104. (B) Given differential equation

$\left(\dfrac{d^3y}{dx^3}\right)^{2/3} + 4 - 3\dfrac{d^2y}{dx^2} + 5\dfrac{dy}{dx} = 0$

$\Rightarrow \left(3\dfrac{d^2y}{dx^2} - 5\dfrac{dy}{dx} - 4\right) = \left(\dfrac{d^3y}{dx^3}\right)^{2/3}$

On cubing both sides,

$\left(\dfrac{d^3y}{dx^3}\right)^2 = \left(3\dfrac{d^2y}{dx^2} - 5\dfrac{dy}{dx} - 4\right)^2$

Degree = 2

105. (D) Given, $\left(x^2 - \dfrac{1}{x}\right)^9$

General term,

$T_{r+1} = {}^nC_r\,(x^2)^{9-r}\,.\left(-\dfrac{1}{x}\right)^r$

$= {}^9C_r\ x^{18-2r}\,(-1)^r\,x^{-r}$
$= {}^9C_r\ x^{(18-3r)}\,(-1)^r$

For independent term,
Put 18 – 3r = 0
$\Rightarrow$ 3r = 18
$\Rightarrow$ r = 6
$\therefore\ T_{(6+1)} = {}^9C_6 x^{(18-18)}\,.\,(-1)^6$

$T_7 = {}^9C_6.1 = \dfrac{9.8.7}{3.2.1} = 84$

106. (A) $\int_{-x/2}^{x/2}|\sin x|\ dx = \int_{-x/2}^{0}(-\sin x)\,dx + \int_0^{x/2}(\sin x)\ dx$

$= -[-\cos x]_{\pi/2}^{0} - [\cos x]_0^{\pi/2}$
$= [\cos 0 - \cos(-\pi/2)] - (\cos\pi/2 - \cos 0)$
$= (1 - 0) - (0 - 1) = 1 + 1 = 2$

107. (B) $\because \cos(\sin^{-1} x) = \dfrac{1}{2}$

$\Rightarrow \sin^{-1} x = \cos^{-1}\left(\dfrac{1}{2}\right)$

$\Rightarrow \sin^{-1} x = \sin^{-1}\dfrac{\sqrt{3}}{2}$

$\Rightarrow x = \dfrac{\sqrt{3}}{2}$

$\therefore \tan(\cos^{-1} x) = \tan\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$

$= \tan\left(\frac{\pi}{6}\right) = \frac{1}{\sqrt{3}}$

Hence, $\tan(\cos^{-1} x)$ have two values.

108. (D) If each item of a data is increased or decreased by the same constant, then standard deviation of the data remains unchanged, i.e., SD is 6.

109. (B) $\log_{81} 243 = \log_{(3)^4} (3)^5 = \frac{5}{4} \log_3 3$

$= \frac{5}{4} \times 1 = \frac{5}{4} = 1.25 \qquad \left(\because \log_{a^n} a^m = \frac{m}{n}\right)$

110. (C) $\int_{In}^{x} \frac{1}{2e^x - 1}\, dx = \text{In}\ \frac{3}{2}$

Let $I = \int_{In2}^{x} \frac{1}{e^x - 1} dx$

Put $e^x - 1 = t \Rightarrow dx = \frac{dt}{1+t}$

$I = \int_{in2}^{x} \frac{1}{t(1+t)} dt = \int_{in2}^{x}\left[\frac{1}{t} - \frac{1}{1+t}\right] dt$

$= [\text{In}\ t - \text{In}\ (1+t)]_{In2}^{x} = [\text{In}\ (e^x - 1)] - \text{In}e^x]_{In2}^{x}$

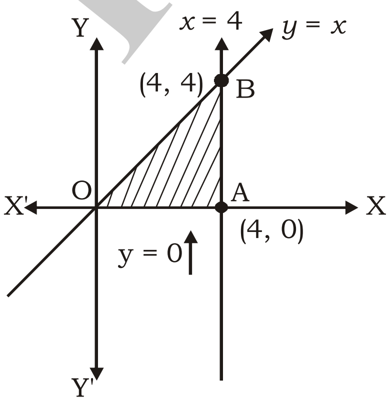
$= \left[In\left(\frac{e^x-1}{e^x}\right)_{In2}^{x}\right] = \text{In}\ \left(\frac{e^x-1}{e^x}\right) - \text{In}\ \frac{1}{2}$

$= \text{In}\ 2\left(\frac{e^x-1}{e^x}\right) \Rightarrow 2\left(\frac{e^x-1}{e^x}\right) = \frac{3}{2}$ (Given)

$\Rightarrow e^x = 4 \Rightarrow x = \text{In}\ 4$

111. (B) $\therefore$ Required Area = area (Δ OAB)

$= \frac{1}{2} \times 4 \times 4 = 8$ sq units



112. (B) If the values of a set are measured in cm, then the variance has unit cm².

113. (B) Let required ratio be λ : 1. Then, the coordinates of point which divides the line joining (– 1,1) and (5, 7) in the ratio λ : 1, is

$\left(\frac{5\lambda - 1}{\lambda + 1}, \frac{7\lambda + 1}{\lambda + 1}\right)$

But it lies on $x + y = 4$

$\therefore \frac{5\lambda - 1}{\lambda + 1} + \frac{7\lambda - 1}{\lambda + 1} = 4$

$\Rightarrow 12\lambda = 4\lambda + 4, \Rightarrow \lambda = 1/2$

$\therefore$ Required ratio = 1 : 2

114. (D) By the definition of the greatest integer function, $[x] = -1$ when $-1 \le x < 0$

and $[x] = 0$ when $0 \le x < 1$

Hence, by the definition of the greatest integer function

$f(x) = \frac{\sin(-1)}{-1} = \sin 1$ when $-1 \le x < 0$ ... (i)

and $f(x) = \frac{\sin 0}{0} = \frac{0}{0}$

When $0 \le x < 1$ .... (ii)

$\therefore$ Lf $(0 - 0) = \lim_{h\to 0} \sin 1 = \sin 1$

and Rf $(0 + 0) = \lim_{h \to 0} 0 = 0$

Since, f (0 – 0) ≠ f (0 + 0), then the limit of f (x) at $x = 0$ does not exist.

115. (D) $\because x + iy = \begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$

$\Rightarrow x + iy = 6i(3i^2 + 3) + 3i(4i + 20) + 1(12 - 60i)$
$= -18i + 18i - 12 + 60i + 12 - 60i = 0$

116. (A)

117. (A)On taking log both sides, we get
p log x + q log y = (p + q) log (x + y)

$\Rightarrow p\frac{1}{x} + q\frac{1}{y}\frac{dy}{dx} = (p+q)\ \frac{1}{x+y} \cdot \left(1 + \frac{dy}{dx}\right)$

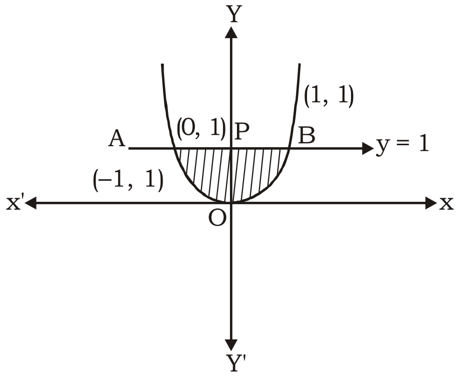
$\frac{p}{x} - \frac{p+q}{x+y} = \left(\frac{p+q}{x+y} - \frac{q}{y}\right)\frac{dy}{dx}$

$\Rightarrow \frac{py - qx}{x(x+y)} = \frac{py - qx}{y(x+y)}\frac{dy}{dx}$

$\frac{dy}{dx} = \frac{y}{x}$

118. (D)

119. (D) Given equation of parabola and line are
$x^2 = y$ ..... (i)
and y = 1 ...... (ii)



On solving Eqs. (i) and (ii), we get
$x^2 = 1 \Rightarrow x = \underline{+} 1$
∴ Required area = 2 × Area of OPBO

$= 2 \int_0^1 x\,dy = \int_0^1 \sqrt{y}\ dy = 2\left[\frac{2y^{2/3}}{3}\right]_0^1$

$= \frac{4}{3}(1 - 0) = \frac{4}{3}$ sq units

120. (B) Given that, α = k and γ = 2i + 3j + 4k
Since, β is perpendicualr to both α and γ.

i.e., $\beta = \underline{+} (\alpha \times \gamma) = + \begin{vmatrix} i & j & k \\ 0 & 0 & 1 \\ 2 & 3 & 4 \end{vmatrix}$

= + i (0 – 3) – j (0 – 2) + k (0 – 0)
= + (– 3i + 2j)

NDA (MATHS) MOCK TEST - 37 (Answer Key)

1.	(B)	21.	(B)	41.	(B)	61.	(A)	81.	(A)	101.	(D)
2.	(B)	22.	(D)	42.	(C)	62.	(C)	82.	(C)	102.	(B)
3.	(C)	23.	(B)	43.	(C)	63.	(D)	83.	(B)	103.	(C)
4.	(A)	24.	(D)	44.	(A)	64.	(D)	84.	(C)	104.	(B)
5.	(B)	25.	(B)	45.	(A)	65.	(D)	85.	(C)	105.	(D)
6.	(B)	26.	(C)	46.	(A)	66.	(D)	86.	(C)	106.	(A)
7.	(B)	27.	(C)	47.	(C)	67.	(*)	87.	(C)	107.	(B)
8.	(B)	28.	(A)	48.	(B)	68.	(A)	88.	(A)	108.	(D)
9.	(C)	29.	(C)	49.	(C)	69.	(C)	89.	(D)	109.	(B)
10.	(D)	30.	(D)	50.	(*)	70.	(D)	90.	(B)	110.	(C)
11.	(A)	31.	(C)	51.	(C)	71.	(D)	91.	(B)	111.	(B)
12.	(B)	32.	(A)	52.	(A)	72.	(A)	92.	(A)	112.	(B)
13.	(B)	33.	(A)	53.	(A)	73.	(B)	93.	(A)	113.	(B)
14.	(C)	34.	(C)	54.	(D)	74.	(B)	94.	(C)	114.	(D)
15.	(D)	35.	(A)	55.	(A)	75.	(A)	95.	(B)	115.	(D)
16.	(B)	36.	(B)	56.	(D)	76.	(D)	96.	(A)	116.	(A)
17.	(C)	37.	(D)	57.	(B)	77.	(C)	97.	(B)	117.	(A)
18.	(B)	38.	(A)	58.	(A)	78.	(C)	98.	(B)	118.	(D)
19.	(B)	39.	(B)	59.	(C)	79.	(D)	99.	(A)	119.	(D)
20.	(B)	40.	(B)	60.	(B)	80.	(C)	100.	(A)	120.	(B)

Note:- If you face any problem regarding result or marks scored, please contact 9313111777

Note:- If your opinion differs regarding any answer, please message the mock test and question number to 8860330003