CAREER POINT

JEE Main Online Exam 2019

Questions & Solutions

10th April 2019 | Shift - II

Mathematics

Q.1 If $\lim\limits_{x\to 1}\dfrac{x^2 - ax + b}{x - 1} = 5$, then a + b is equal to :

(1) 1 (2) – 4 (3) – 7 (4) 5

Ans. **[3]**

Sol. $\lim\limits_{x\to 1}\dfrac{x^2 - ax + b}{x - 1} = 5$

$(1)^2 - a(1) + b = 0$

$1 - a + b = 0$

$a - b = 1$ ...(1)

Now

'L' hospital rule

$2x - a = 5$

$2 - a = 5$ ($\because$ x = 1)

$a = -3$ ....(2)

Put in (1)

$\therefore$ $b = -4$

$a + b = -7$

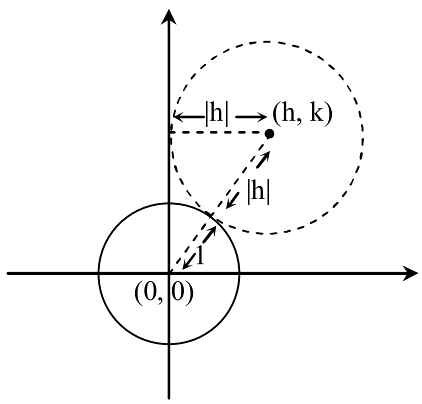
Q.2 The locus of the centres of the circles, which touch the circle, $x^2 + y^2 = 1$ externally, also touch the y-axis and lie in the first quadrant, is

(1) $x = \sqrt{1+2y}$, $y \ge 0$ (2) $y = \sqrt{1+2x}$, $x \ge 0$

(3) $y = \sqrt{1+4x}$, $x \ge 0$ (4) $x = \sqrt{1+4y}$, $y \ge 0$

Ans. **[2]**

Sol.



$\sqrt{h^2 + k^2} = 1 + |h|$

$h^2 + k^2 = 1 + h^2 + 2|h|$

$k^2 = 1 + 2|h|$

$y^2 = 1 + 2x$

Q.3 The number of real roots of the equation $5 + |2^x - 1| = 2^x(2^x - 2)$ is

(1) 2 (2) 1 (3) 3 (4) 4

Ans. **[2]**

Sol. $2^x \geq 1$

$5 + 2^x - 1 = 2^x(2^x - 2)$

Let $2^x = t$

$5 + t - 1 = t(t - 2)$

$t = 4, -1$(rejected)

$2^x = 4$

$x = 2$

only 1 solution

$2^x < 1$

$5 + 1 - 2^x = 2^x(2^x - 2)$

$2^x = t$

$5 + 1 - t = t(t - 2)$

$0 = t^2 - t - 6$

$0 = (t - 3)(t - 2)$

$t = 3, -2$

$2^x = 3, 2^x = -2$

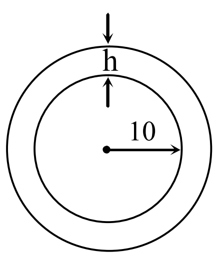
(rejected)

Q.4 A spherical iron ball of radius 10 cm is coated with a layer of ice of uniform thickness that melts at a rate of 50 cm^3/min. When the thickness of the ice is 5 cm, then the rate at which the thickness (in cm/min) of the ice decreases, is :

(1) $\frac{5}{6\pi}$ (2) $\frac{1}{9\pi}$ (3) $\frac{1}{36\pi}$ (4) $\frac{1}{18\pi}$

Ans. **[4]**

Sol.



$$V = \frac{4}{3}\pi\left((10 + h)^3 - 10^3\right)$$

$$\frac{dV}{dt} = 4\pi(10 + h)^2 \frac{dh}{dt}$$

$$-50 = 4\pi(10 + 5)^2 \frac{dh}{dt}$$

$$\Rightarrow \frac{dh}{dt} = \frac{-1}{18\pi} \frac{cm}{min}$$

Q.5 The sum $1 + \frac{1^3 + 2^3}{1 + 2} + \frac{1^3 + 2^3 + 3^3}{1 + 2 + 3} + ... + \frac{1^3 + 2^3 + 3^3 + ... + 15^3}{1 + 2 + 3 + ... + 15} - \frac{1}{2}(1 + 2 + 3 + ... + 15)$ is equal to :

(1) 620 (2) 1240 (3) 1860 (4) 660

Ans. **[1]**

Sol. Sum = $\sum_{n=1}^{15}\frac{1^3+2^3+.....+n^3}{1+2+....+n}-\frac{1}{2}\frac{15\times16}{2}$

$=\sum_{n=1}^{15}\frac{n(n+1)}{2}-60$

$=\frac{1}{2}\sum_{n=1}^{15}n^2+\frac{1}{2}\sum_{n=1}^{15}n-60$

$=\frac{1}{2}\times\frac{15\times16\times31}{6}+\frac{1}{2}\times\frac{15\times16}{2}-60$

= 620

Q.6 If the plane 2x – y + 2z + 3 = 0 has the distances $\frac{1}{3}$ and $\frac{2}{3}$ units from the planes 4x – 2y + 4z + λ = 0 and 2x – y + 2z + μ = 0, respectively, then the maximum value of λ + μ is equal to :

(1) 13 (2) 9 (3) 5 (4) 15

Ans. **[1]**

Sol. Distance formula

(i) $\frac{|\lambda-6|}{\sqrt{16+4+16}}=\left|\frac{\lambda-6}{6}\right|=\frac{1}{3}$

$|\lambda-6|=2$

$\lambda=8, 4$

(ii) $\frac{|\mu-3|}{\sqrt{4+4+1}}=\frac{2}{3}$

$|\mu-3|=2$

$\mu=5, 1$

$\therefore(\mu+\lambda)_{max}=13$

Q.7 Let f(x) = $\log_e(\sin x)$, $(0 < x < \pi)$ and g(x) = $\sin^{-1}(e^{-x})$, $(x \ge 0)$. If α is a positive real number such that a = (fog)' (α) and b = (fog) (α), then :

(1) $a\alpha^2+b\alpha-a=-2\alpha^2$ (2) $a\alpha^2+b\alpha+a=0$

(3) $a\alpha^2-b\alpha-a=0$ (4) $a\alpha^2+b\alpha-a=1$

Ans. **[4]**

Sol. $f(g(x))=-x\Rightarrow(f(g(x)))'=-1$

$f(g(\alpha))=-\alpha=b\Rightarrow(f(g(\alpha)))'=-1=a$

$\therefore b=-\alpha$

$a=-1$

Now check from options

Q.8 The angles A, B and C of a triangle ABC are in A.P. and a : b = $1:\sqrt{3}$. If c = 4 cm, then the area (in sq. cm) of this triangle is :

(1) $2\sqrt{3}$ (2) $4\sqrt{3}$ (3) $\frac{4}{\sqrt{3}}$ (4) $\frac{2}{\sqrt{3}}$

Ans. **[1]**

Sol. $\because$ 2B = A + C

& A + B + C = π

3B = π

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

$\therefore$ $A + C = \frac{2\pi}{3}$ σ

$\frac{a}{b} = \frac{1}{\sqrt{3}}$

$\frac{2R\sin A}{2R\sin B} = \frac{1}{\sqrt{3}}$

$\sin A = \frac{1}{2}$

$\therefore$ A = 30°

$\therefore$ a = 2, b = $2\sqrt{3}$, c = 4

$\Delta = \frac{1}{2} \times 2\sqrt{3} \times 2 = 2\sqrt{3}$

Q.9 Minimum number of times a fair coin must be tossed so that the probability of getting at least one head is more than 99% is :

(1) 6 (2) 7 (3) 8 (4) 5

Ans. **[2]**

Sol. $1 - \left(\frac{1}{2}\right)^n > \frac{99}{100}$

$\left(\frac{1}{2}\right)^n < \frac{1}{100}$

$\Rightarrow$ n = 7

Q.10 Let λ be a real number for which the system of linear equations x + y + x = 6, $4x + \lambda y - \lambda z = \lambda - 2$, $3x + 2y - 4z = -5$ has infinitely many solutions. Then λ is a root of the quadratic equation:

(1) $\lambda^2 + \lambda - 6 = 0$ (2) $\lambda^2 - \lambda - 6 = 0$ (3) $\lambda^2 - 3\lambda - 4 = 0$ (4) $\lambda^2 + 3\lambda - 4 = 0$

Ans. **[2]**

Sol. $\Delta = 0$

$$\begin{vmatrix} 1 & 1 & 1 \\ 4 & \lambda & -\lambda \\ 3 & 2 & -4 \end{vmatrix} = 0$$

On solving we get $\lambda = 3$

Q.11 If z and w are two complex numbers such that |zw| = 1 and $\arg(z) - \arg(w) = \frac{\pi}{2}$, then:

(1) $z\overline{w} = \frac{1-i}{\sqrt{2}}$ (2) $\overline{z}w = i$ (3) $\overline{z}w = -i$ (4) $z\overline{w} = \frac{-1+i}{\sqrt{2}}$

Ans. [3]

Sol. $|zw| = 1$

$|z|\,|w| = 1$

Let $w = \frac{1}{r}e^{i\theta}$

then $z = re^{i\left(\theta+\frac{\pi}{2}\right)}$

$\bar{z}w = e^{-i\left(\theta+\frac{\pi}{2}\right)}.e^{i\theta} = e^{-i(\pi/2)} = -i$

& $z\bar{w} = e^{i\left(\theta+\frac{\pi}{2}\right)}.\,e^{-i\theta} = e^{i\pi/2} = i$

Q.12 The smallest natural number n, such that the coefficient of x in the expansion of $\left(x^2 + \frac{1}{x^3}\right)^n$ is ${}^nC_{23}$, is:

(1) 23 (2) 58 (3) 38 (4) 35

Ans. [3]

Sol. General term

$T_{r+1} = {}^nC_r\, x^{2n-2r}.\, x^{-3r}$

$\because$ $2n - 5r = 1 \Rightarrow 2n = 5r + 1$

$\therefore$ $r = \frac{2n-1}{5}$

$\therefore$ Coeff. of $x = {}^nC_{\left(\frac{2n-1}{5}\right)} = {}^nC_{23}$

$\therefore$ $\frac{2n-1}{5} = 23$ or $n - \left(\frac{2n-1}{5}\right) = 23$

$2n - 1 = 115$ $\quad$ $n = 38$

$n = 58$ $\quad$ $\therefore$ smallest $n = 38$

Q.13 The sum of the real roots of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0$, is equal to :

(1) – 4 (2) 0 (3) 1 (4) 6

Ans. [2]

Sol. Expand

$x(-3x \times (x+2) - 2x(x-3)) + (-6)\,(2(x+2) + 3\,(x-3)) + (-1)\,(4x + 3\,(-3x))$

$\Rightarrow -5x^3 + 30x - 30 + 5x = 0$

$x^3 - 7x + 6 = 0$

Sum of roots = 0

Q.14 If $5x + 9 = 0$ is the directrix of the hyperbola $16x^2 - 9y^2 = 144$, then its corresponding focus is :

(1) $\left(\frac{5}{3}, 0\right)$ (2) (5, 0) (3) (–5, 0) (4) $\left(-\frac{5}{3}, 0\right)$

Ans. [3]

Sol. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

a = 3

b = 4

$e^2 = 1 + \frac{b^2}{a^2}$

$e^2 = 1 + \frac{16}{9}$

$e = \frac{5}{3}$

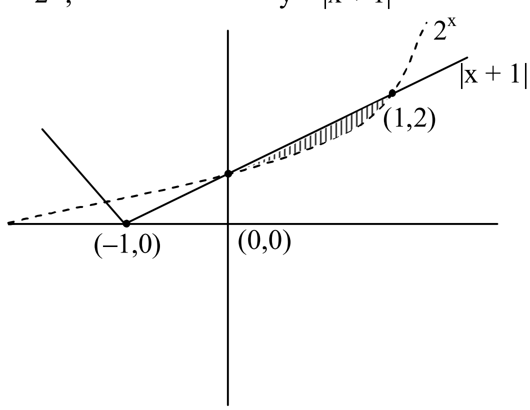
$\therefore$ focus is (–ae, 0) = (–5, 0)

Q.15 The area (in sq.units) of the region bounded by the curves $y = 2^x$ and $y = |x + 1|$, in the first quadrant is :

(1) $\frac{1}{2}$ (2) $\frac{3}{2} - \frac{1}{\log_e 2}$ (3) $\frac{3}{2}$ (4) $\log_e 2 + \frac{3}{2}$

Ans. **[2]**

Sol. $y = 2^x$; $y = |x + 1|$



Required Area = $\int_0^1 ((x+1) - 2^x)\,dx$

$= \left(\frac{x^2}{2} + x - \frac{2^x}{\log_e 2}\right)_0^1$

$= \frac{3}{2} - \frac{1}{\log_e 2}$

Q.16 If the line ax + y = c, touches both the curves $x^2 + y^2 = 1$ and $y^2 = 4\sqrt{2}x$, then |c| is equal to :

(1) $\frac{1}{\sqrt{2}}$ (2) 2 (3) $\sqrt{2}$ (4) $\frac{1}{2}$

Ans. **[3]**

Sol. Tangent to the curve $y^2 = 4\sqrt{2}x$ is $y = mx + \frac{\sqrt{2}}{m}$

It is tangent to the circle $x^2 + y^2 = 1$

$$\therefore \left|\frac{\sqrt{2}/m}{\sqrt{1+m^2}}\right| = 1 \Rightarrow m = \pm 1$$

$\therefore$ tangent are $y = x + \sqrt{2}$ & $y = -x - \sqrt{2}$

Compare with $y = -ax + c$

$\Rightarrow a = \pm 1$ & $c = \pm\sqrt{2}$

Q.17 The integral $\int_{\pi/6}^{\pi/3} \sec^{2/3} x \operatorname{cosec}^{4/3} x\, dx$ is equal to :

(1) $3^{\frac{5}{3}} - 3^{\frac{1}{3}}$ (2) $3^{\frac{5}{6}} - 3^{\frac{2}{3}}$ (3) $3^{\frac{4}{3}} - 3^{\frac{1}{3}}$ (4) $3^{\frac{7}{6}} - 3^{\frac{5}{6}}$

Ans. **[4]**

Sol. $\int_{\pi/6}^{\pi/3} \sec^{2/3} x \operatorname{cosec}^{4/3} x\, dx$

$= \int \frac{\sec^2 x}{\tan^{4/3} x} dx$

Let $\tan x = t$, $\sec^2 x\, dx = dt$

$= \int \frac{dt}{t^{4/3}}$

$I = -3\,(t^{-1/3})$

$= \left(-3(\tan x)^{\frac{-1}{3}}\right)_{\pi/6}^{\pi/3}$

$= 3\left(3^{\frac{1}{3}} - \frac{1}{3^{\frac{1}{6}}}\right)$

$= 3^{7/6} - 3^{5/6}$

Q.18 Suppose that 20 pillars of the same height have been erected along the boundary of a circular stadium. If the top of each pillar has been connected by beams with the top of all its non-adjacent pillars, then the total number of beams is :

(1) 180 (2) 170 (3) 190 (4) 210

Ans. **[2]**

Sol. $\frac{{}^{20}C_1 \times {}^{17}C_1}{2} = 170$

Q.19 Let a, b and c be in G.P. with common ratio r, where $a \neq 0$ and $0 < r \leq \frac{1}{2}$. If 3a, 7b and 15c are the first three terms of an A.P., then the 4^{th} term of this A.P. is :

(1) a (2) $\frac{7}{3}a$ (3) $\frac{2}{3}a$ (4) 5a

Ans. **[1]**

Sol. $a = a$

$b = ar$

$c = ar^2$

$3a, 7b, 15c \longrightarrow$ A.P.

$14b = 3a + 15c$

$14(ar) = 3a + 15(ar^2)$

$15r^2 - 14r + 3 = 0$

$\Rightarrow r = \frac{1}{3}, \frac{3}{5}$ (rejected)

Common difference $= 7b - 3a$

$= 7ar - 3a$

$= \frac{7a}{3} - 3a$

$= -\frac{2}{3}a$

4^{th} term is $\Rightarrow 15c - \frac{2}{3}a = \frac{15}{9}a - \frac{2}{3}a = a$

Q.20 If $\int x^5 e^{-x^2} dx = g(x)e^{-x^2} + c$, where c is a constant of integration, then g(–1) is equal to :

(1) – 1 (2) $-\frac{5}{2}$ (3) 1 (4) $-\frac{1}{2}$

Ans. **[2]**

Sol. Let $x^2 = t$

$\Rightarrow \frac{1}{2}\int t^2 e^{-t} dt$

$= \frac{1}{2}[-t^2 e^{-t} + \int 2te^{-t} dt]$

$= \frac{-t^2 e^{-t}}{2} - te^{-t} - e^{-t}$

$= \left(-\frac{x^4}{2} - x^2 - 1\right)e^{-x^2} + c$

$g(x) = -\frac{x^4}{2} - x^2 - 1$

$g(-1) = -\frac{1}{2} - 1 - 1$

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

Q.21 Let $y = y(x)$ be the solution of the differential equation, $\frac{dy}{dx} + y \tan x = 2x + x^2 \tan x$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, such that $y(0) = 1$. Then :

(1) $y\left(\frac{\pi}{4}\right) - y\left(-\frac{\pi}{4}\right) = \sqrt{2}$

(2) $y'\left(\frac{\pi}{4}\right) - y'\left(-\frac{\pi}{4}\right) = \pi - \sqrt{2}$

(3) $y\left(\frac{\pi}{4}\right) + y\left(-\frac{\pi}{4}\right) = \frac{\pi^2}{2} + 2$

(4) $y'\left(\frac{\pi}{4}\right) + y'\left(-\frac{\pi}{4}\right) = -\sqrt{2}$

Ans. [2]

Sol. $\frac{dy}{dx} + y(\tan x) = 2x + x^2 \tan x$

I. F. $= e^{\int \tan x\,dx} = e^{\ln \sec x} = \sec x$

$y.\sec x = \int (2x + x^2 \tan x)\sec x\,dx$

$y \sec x = x^2 \sec x + \lambda$

$\Rightarrow y = x^2 + \lambda \cos x$

$y(0) = 0 + \lambda = 1 \Rightarrow \lambda = 1$

$y = x^2 + \cos x$

$y' = 2x - \sin x$

$y'\left(\frac{\pi}{4}\right) = \frac{\pi}{2} - \frac{1}{\sqrt{2}}$

$y'\left(-\frac{\pi}{4}\right) = -\frac{\pi}{2} + \frac{1}{\sqrt{2}}$

Q.22 The tangent and normal to the ellipse $3x^2 + 5y^2 = 32$ at the point P(2, 2) meet the x-axis at Q and R, respectively. Then the area (in sq. units) of the triangle PQR is :

(1) $\frac{14}{3}$ (2) $\frac{16}{3}$ (3) $\frac{68}{15}$ (4) $\frac{34}{15}$

Ans. [3]

Sol. $3x^2 + 5y^2 = 32$

$6x + 10yy' = 0$

$y' = \frac{-3x}{5y}$

$y'_{(2,\,2)} = -\frac{3}{5}$

Tangent $(y - 2) = -\frac{3}{5}(x - 2) \Rightarrow Q\left(\frac{16}{3}, 0\right)$

Normal $(y - 2) = \frac{5}{3}(x - 2) \Rightarrow R\left(\frac{4}{5}, 0\right)$

Area $= \frac{1}{2}(QR) \times 2 = QR = \frac{68}{15}$

Q.23 If the tangent to the curve $y = \frac{x}{x^2 - 3}$, $x \in \rho$, $(x \neq \pm\sqrt{3})$, at a point $(\alpha, \beta) \neq (0, 0)$ on it is parallel to the line $2x + 6y - 11 = 0$, then :

(1) $|6\alpha + 2\beta| = 9$ (2) $|2\alpha + 6\beta| = 11$ (3) $|2\alpha + 6\beta| = 19$ (4) $|6\alpha + 2\beta| = 19$

Ans. [4]

Sol. $\left.\frac{dy}{dx}\right|_{(\alpha,\beta)} = \frac{-\alpha^2 - 3}{(\alpha^2 - 3)^2}$

Given

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

$\Rightarrow \alpha = 0, \pm 3\ (\alpha \neq 0)$

Q.24 Lines are drawn parallel to the line $4x - 3y + 2 = 0$, at a distance $\frac{3}{5}$ from the origin. Then which one of the following points lies on any of these lines ?

(1) $\left(\frac{1}{4}, -\frac{1}{3}\right)$ (2) $\left(-\frac{1}{4}, \frac{2}{3}\right)$ (3) $\left(\frac{1}{4}, \frac{1}{3}\right)$ (4) $\left(-\frac{1}{4}, -\frac{2}{3}\right)$

Ans. **[2]**

Sol. Line parallel to $4x - 3y + 2 = 0$

is given as $4x - 3y + \lambda = 0$

distance from origin is

$$\left|\frac{\lambda}{5}\right| = \frac{3}{5}$$

$\lambda = \pm 3$

$\therefore$ required lines are $4x - 3y + 3 = 0$ & $4x - 3y - 3 = 0$

Now check options

Q.25 The negation of the Boolean expression $\sim s \vee (\sim r \wedge s)$ is equivalent to :

(1) $\sim s \wedge \sim r$ (2) r (3) $s \wedge r$ (4) $s \vee r$

Ans. **[3]**

Sol. $\sim (\sim s \vee (\sim r \wedge s))$

$s \wedge (r \vee \sim s)$

$(s \wedge r) \vee (s \wedge \sim s)$

$(s \wedge r) \wedge (s)$

$(s \wedge r)$

Q.26 If both the mean and the standard deviation of 50 observations $x_1, x_2, \ldots, x_{50}$ are equal to 16, then the mean of $(x_1 - 4)^2, (x_2 - 4)^2, \ldots\ldots, (x_{50} - 4)^2$ is :

(1) 400 (2) 480 (3) 380 (4) 525

Ans. **[1]**

Sol. $\text{Mean}(\mu) = \frac{\sum x_i}{50} = 16$

$\therefore \sum x_i = 16 \times 50$

$$\text{S.D.}(\sigma) = \sqrt{\frac{\sum x_i^2}{50} - (\mu)^2} = 16$$

$$\Rightarrow \frac{\sum x_i^2}{50} = 256 \times 2$$

Required mean = $\dfrac{\sum (x_i - 4)^2}{50}$

$= \dfrac{\sum x_i^2 + 16 \times 50 - 8\sum x_i}{50}$

= 256 × 2 + 16 – 8 × 16

= 400

Q.27 Let $a_1, a_2, a_3, ...$ be an A.P. with $a_6 = 2$. Then the common difference of this A.P., which maximises the product $a_1 a_4 a_5$, is :

(1) $\frac{3}{2}$ (2) $\frac{6}{5}$ (3) $\frac{8}{5}$ (4) $\frac{2}{3}$

Ans. **[3]**

Sol. first term = a

Common difference = d

$\therefore a + 5d = 2$

$a_1 . a_4 . a_5 = a(a + 3d)(a + 4d)$

$f(d) = (2 - 5d)(2 - 2d)(2 - d)$

$f'(d) = 0 \Rightarrow d = \frac{2}{3}, \frac{8}{5}$

$f''(d) < 0$ at $d = \frac{8}{5}$

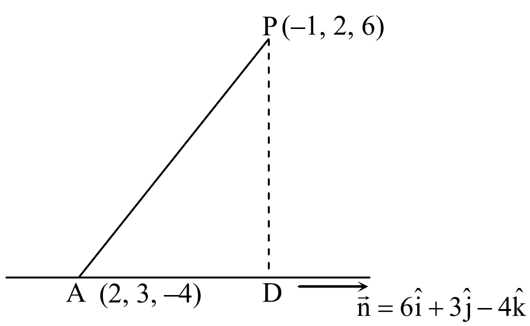
$\Rightarrow d = \frac{8}{5}$

Q.28 The distance of the point having position vector $-\hat{i} + 2\hat{j} + 6\hat{k}$ from the straight line passing through the point (2, 3, – 4) and parallel to the vector, $6\hat{i} + 3\hat{j} - 4\hat{k}$ is :

(1) 6 (2) 7 (3) $2\sqrt{13}$ (4) $4\sqrt{3}$

Ans. **[2]**

Sol.



$AD = \left|\dfrac{\overrightarrow{AP}.\vec{n}}{|\vec{n}|}\right| = \sqrt{61}$

$PD = \sqrt{AP^2 - AD^2}$

$= \sqrt{110 - 61}$

= 7

Q.29 If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$, where $-1 \le x \le 1, -2 \le y \le 2, x \le \frac{y}{2}$, then for all x, y, $4x^2 - 4xy \cos\alpha + y^2$ is equal to :

(1) $4 \sin^2\alpha$ (2) $2 \sin^2\alpha$ (3) $4 \sin^2\alpha - 2x^2y^2$ (4) $4 \cos^2\alpha + 2x^2y^2$

Ans. **[1]**

Sol. $\cos^{-1}x - \cos^{-1} \frac{y}{2} = \alpha$

$\cos\left(\cos^{-1} x - \cos^{-1}\left(\frac{y}{2}\right)\right) = \cos \alpha$

$x\frac{y}{2} + \sqrt{1-x^2}\sqrt{1-\frac{y^2}{4}} = \cos \alpha$

$\left(\cos\alpha - \frac{xy}{2}\right) = \sqrt{1-x^2}\sqrt{1-\frac{y^2}{4}}$

Squaring both sides

$x^2 + \frac{y^2}{4} - xy \cos \alpha = 1 - \cos^2 \alpha = \sin^2 \alpha$

Q.30 A perpendicular is drawn from a point on the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1}$ to the plane x + y + z = 3 such that the foot of the perpendicular Q also lies on the plane x – y + z = 3. Then the co-ordinates of Q are :

(1) (4, 0, – 1) (2) (2, 0, 1) (3) (1, 0, 2) (4) (– 1, 0, 4)

Ans. **[2]**

Sol. $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1} = \lambda$

Let a point P on the line is

$(2\lambda + 1, -\lambda - 1, +\lambda)$

Foot of $\perp^r$ Q is given by

$\frac{x-2\lambda-1}{1} = \frac{y+\lambda+1}{1} = \frac{z-\lambda}{1} = -\frac{(2\lambda-3)}{3}$

$\because$ Q lies on x + y + z = 3 & x – y + z = 3

$\Rightarrow$ x + z = 3 & y = 0

$\therefore y = 0 \Rightarrow \lambda + 1 = \frac{-2\lambda+3}{3} \Rightarrow \lambda = 0$

$\therefore$ Q is (2, 0, 1)