JSPM's

Imperial College of Engineering and Research, Wagholi, Pune.

(Approved by AICTE, Delhi & Govt. of Maharashtra, affiliated to SPPU)

Gat.No.720, Pune-Nagar road, Wagholi, Pune, 412207.

Phone No. 020-67335100 **website**: www.jspmicoer.edu.in **Email-** principal@jspmicoer.edu.in

Accredited with 'A' Grade by NAAC

Dr. T. J. Sawant
Founder Secretary

Dr. R. S .Deshpande
Principal

DTE Code- 6160

Bachelor of Engineering (B.E)		
Sr. No	**U.G Courses**	**Intake**
1.	Civil Engineering (Morning Shift)	120
2.	Civil Engineering (Afternoon Shift)	60
3.	Computer Engineering	60
4.	E&TC Engineering	120
5.	Mechanical Engineering (Morning Shift)	120
6.	Mechanical Engineering (Afternoon Shift)	120

Admissions Open For First Year /Direct second Year Engineering /MBA/ME for **A.Y. 2020-21**

Contact: 9881787751,7757977775,9665990098

MHT- CET 2018 Solution

Subject :- Mathematics

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1.

Difficulty : Easy

Topics :

Definite integration,

$$\begin{array}{ccccc} x & & 1 & & 0 \\ sec^2x & \searrow^{+} & tanx & \searrow^{-} & lnsecx \end{array}$$

$$I = (x\tan x - ln\sec x)_0^{\pi/4} = \frac{\pi}{4}(1) - ln\sqrt{2}$$

$$I = \frac{\pi}{4} - \log\sqrt{2}$$

2.

Difficulty : Easy

Topics :

Trigonometric Function,

$$2b = a + c$$

$$\therefore \frac{a}{2}\left(2cos^2\left(\frac{C}{2}\right)\right) + \frac{C}{2}\left(2cos^2\left(\frac{A}{2}\right)\right)$$

$$\therefore \frac{a}{2}(1 + cosc) + \frac{c}{2}(1 + cosA)$$

$$\therefore \frac{1}{2}(a + acosc + c + ccosA)$$

$$\therefore \frac{1}{2}(a + c + b)$$

$$\therefore \frac{1}{2}(2b + b)$$

$$\therefore \frac{3b}{2}$$

3.

Difficulty : Medium

Topics : Differentiation

$$\frac{dx}{d\theta} = e^{\theta}(cos\theta + sin\theta) + (sin\theta - cos\theta)e^{\theta} = 2e^{\theta}sin\theta$$

$$\frac{dy}{d\theta} = e^{\theta}(cos\theta - sin\theta) + (sin\theta + cos\theta)e^{\theta} = 2e^{\theta}cos\theta$$

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{2e^{\theta}cos\theta}{2e^{\theta}sin\theta} = cot\theta$$

$$\frac{dy}{dx}|_{\theta=\frac{\pi}{4}} = cot\left(\frac{\pi}{4}\right) = 1$$

$$\frac{dy}{dx} = 1$$

4.

Difficulty : Medium

Topics :

Trigonometrical ratios of Compound angles,

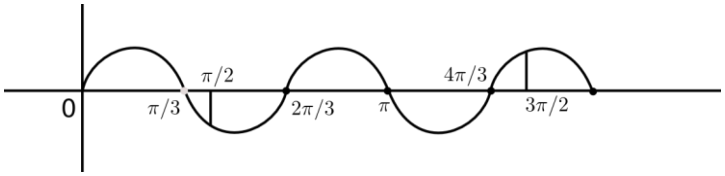
$$(sinx + sin5x) + sin3x = 0$$

$$2sin3xcos2x + sin3x = 0$$

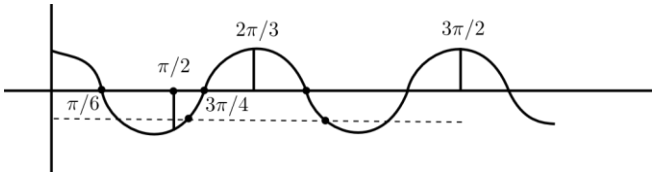
$$sin3x(2cos2x + 1) = 0$$

$$sin3x = 0 \text{ and } 2cos2x + 1 = 0$$

$$cos2x = -\frac{1}{2}$$



$x = \frac{2\pi}{3}$ *or* $x = \pi$ *or* $x = 4\pi$, $\therefore sin3x = 0$ have 3 solutions



$cos2x = -\frac{1}{2}$ have 2 solutions

5.

Difficulty : Easy

Topics :

Trigonometric Function,

$$tan^{-1}2x + tan^{-1}3x = \frac{\pi}{4}$$

$$tan^{-1}\left(\frac{2x+3x}{1-6x^2}\right) = \frac{\pi}{4}; x > 0$$

$$\frac{5x}{1-6x^2} = 1$$

$$5x = 1 - 6x^2$$

$$6x^2 + 5x - 1 = 0$$

$$6x^2 + 6x - x - 1 = 0$$

$$6x(x+1) - 1(x+1) = 0$$

$$(6x-1)(x+1) = 0$$

$$x \neq -1 \; x = \frac{1}{6} \;;$$

6.

Difficulty : Easy

Topics :

Determinants & Matrices,

$$a_{31}A_{31} + a_{32}A_{32} + a_{33}A_{33} = |A|$$

$$|A| = 1(7-20) - 2(7-10) + 3(4-2)$$

$$= -13 + 6 + 6$$

$$= -1$$

$$|A| = -1$$

7.

Difficulty : Difficult

Topics :

Mathematics,

Topic - Mathematical logic

$p \to (q \wedge r)$

contrapositive $(\sim (q \wedge r)) \to \sim p$

$\therefore (\sim q \vee \sim r) \to \sim p$

If my friends do not come or we do not go for picnic then weather will not be fine.

8.

Difficulty : Medium

Topics :

Application of derivatives,

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

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

$f'(x) > 0$

$\therefore (-x^2+1) > 0$ as x^2+1 is always positive

$\therefore x^2 - 1 < 0$

$\therefore (x-1)(x+1) < 0$

$x \in (-1, 1)$

9.

Difficulty : Medium

Topic:Mathematics

(OR)

$X = \{4^n - 3n - 1 : n \in N\}$

$X = \{(1+3)^n, 3, 4, 5, 6, 1 \ldots in \in XN\} and\ Y$

$X = \left\{1 + 3n + \frac{3^2 n(n-1)}{2!} + \frac{3^3 n(n-1)(2n-1)}{6} \ldots . 3n - 1\right\}$

$X = \left\{3^2 (n-1)n \left(\frac{1}{2!} + \frac{3(2n-1)}{6} + \ldots..\right)\right\}$

$X = \left\{9(n-1)n \left(\frac{1}{2!} + \ldots\ldots\right)\right\}$

$Y = \{9(n-1) : n \in N\}$

$\therefore X \subseteq Y$

$\therefore X \cap Y = X$

Put

$X = \{0, 9, 54, \ldots.\}$

$Y = \{0, 9, 18, 27, 36, 45, 54, 63 \ldots.\}$

$X \subseteq Y$

$\therefore X \cap Y = X$

10.

Difficulty : Easy

Topic - Mathematical logic

$(p \wedge \sim p) \wedge q$

$F \wedge q$

F contradiction.

11.

Difficulty : Easy

Topics :

Definite integration,

$$\frac{1}{2}\int_0^k \frac{dx}{1+9x^2} = \frac{\pi}{24}$$

$$\int_0^k \frac{dx}{1+(3x)^2} = \frac{\pi}{12}$$

$$\left(\frac{1}{3}tan^{-1}(3x)\right)_0^k = \frac{\pi}{12}$$

$$tan^{-1}3k = \frac{\pi}{4}$$

$$3k = 1$$

$$k = \frac{1}{3}$$

12.

Difficulty : Easy

Topics : Conics

$$t = \frac{1}{2}; y^2 = -16x$$

$$y^2 = -4ax$$

$$a = 4$$

$$P(t) = (-at^2, 2at) = \left(-4 \times \frac{1}{4}, 2\left(\frac{1}{2}4\right)\right)$$

$$P(t) = (-1, 4)$$

13.

Difficulty : Medium

Topics :

Indefinite integration,

$$I = \int \frac{1}{\sin x \cdot \cos^2 x}$$

$$I = \int \frac{\sin^2 x + \cos^2 x}{\sin x \cdot \cos^2 x} dx$$

$$I = \int \frac{\sin^2 x}{\sin x \cdot \cos^2 x} dx + \int \frac{\cos^2 x dx}{\sin x \cos^2 x}$$

$$I = \int \sec x \tan x dx + \int co \sec x dx$$

$$I = \sec x + ln\left|\operatorname{cosec} x - \cot x\right| + c$$

14.

Difficulty : Medium

Topics :

Differentiation,

$$\frac{x^3-y^3}{x^3+y^3}=10^2=100$$

$$\frac{x^n-y^n}{x^n+y^n}=k \text{ then } \frac{dy}{dx}=\frac{y}{x} \text{ and } \frac{d^2y}{dx^2}=0$$

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

15.

Difficulty : Easy

Topics :

SETS, RELATION AND FUNCTIONS,

$$f(x)=\frac{(x-2)(x+2)}{(x-2)};D_f:R-\{2\}$$

$$R_f:R-\{4\}$$

16.

Difficulty : Medium

Topics :

Plane,

$$\cos\left(\frac{\pi}{3}\right)=\left(\frac{2P+P-2}{\sqrt{P^2+5}\sqrt{P^2+5}}\right)$$

$$\frac{1}{2}=\left(\frac{3P-2}{P^2+5}\right)$$

$$P^2+5=6P-4$$

$$P^2-6P+9=0$$

$$(P-3)^3=0$$

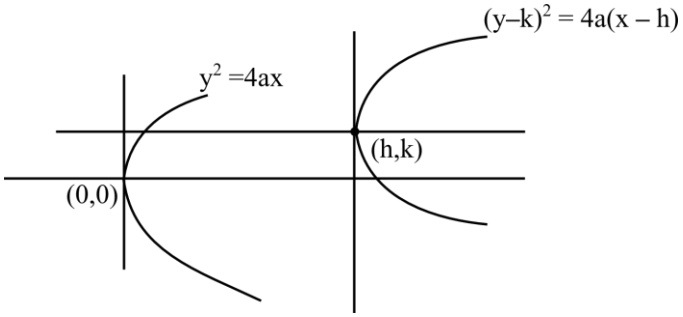
$$P=3$$

17.

Difficulty : Medium

Topics :

Differentiation,



Equation of parabola

$\therefore$ $(y-k)^2 = 4a(x-h)$ have two arbitary constants h and k

$\therefore$ Order $= 2$

18. Difficulty : Easy

Topics : Straight lines,

$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$$

$$\frac{x-3}{1} = \frac{y-k}{2} = \frac{z-0}{1}$$

$$\begin{bmatrix} 3-1 & k+1 & 0-1 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{bmatrix} = 0$$

$$\begin{bmatrix} 2 & k+1 & -1 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{bmatrix} = 0$$

$$2(-5) - (k+1)(-2) - 1(1) = 0$$

$$-10 + 2k + 2 - 1 = 0$$

$$2k = 9$$

$$k = \frac{9}{2}$$

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19.

Difficulty : Easy

Topics :

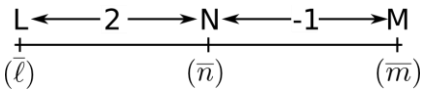
Three Dimensional Geometry,

$$\cos^2\beta = 1 - cos^2\alpha - cos^2\gamma$$
$$= 1 - \cos^2(120^0) - cos^2(60^0)$$
$$= 1 - \frac{1}{4} - \frac{1}{4}$$
$$= 1 - \frac{1}{2} = \frac{1}{2}$$
$$\cos\beta = \pm\frac{1}{\sqrt{2}}$$
$$\beta = 135^0$$

20.

Difficulty : Easy

Topics : Vectors,



$$\therefore \overline{n} = \frac{2(\overline{m}) - \bar{\ell}}{2-1}$$
$$\overline{n} = 2(\overline{a} + 2\bar{b}) - (2\overline{a} - \bar{b})$$
$$\overline{n} = 2\overline{a} + 4\bar{b} - 2\overline{a} + \bar{b}$$
$$\overline{n} = 5\bar{b}$$

21.

Difficulty : Easy

Topics :

Trigonometric Ratios & Identities,

$\cos^o 1^o \cos 2^o \cos 3^o \ldots \cos 90^o \ldots \cos 179^o$

$\therefore \cos 1^o \cos 2^o \cos 3^o \ldots 0 \ldots \cos 179^o$

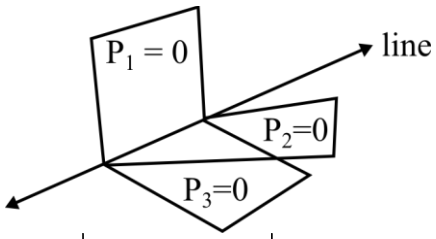
$= 0$

22.

Difficulty : Difficult

Topic

Plane



$$\therefore \begin{vmatrix} 1 & -c & -b \\ c & -1 & a \\ b & a & -1 \end{vmatrix} = 0$$

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

$1 - a^2 - c^2 - abc - abc - b^2 = 0$

$1 - 2abc - a^2 - b^2 - c^2 = 0$

$1 - 2abc = a^2 + b^2 + c^2$

23.

Difficulty : Easy

Topics :

Pair of straight lines,

$$x^2 - y^2 + x + 3y - 2 = 0$$

$$ax^2 + 2hxy + by^2 + 2yz + 2fy + c = 0$$

$$a = 1, h = 0, b = -1, g = \frac{1}{2}, f = \frac{3}{2}, c = -2$$

$$\begin{vmatrix} 1 & 0 \\ 0 & -1 \\ \frac{1}{2} & \frac{3}{2} \\ 1 & 0 \end{vmatrix}$$

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

24.

Difficulty : Easy

Topics :

Random Variables & its Probability Distribution,

$$X = \{1, 2, 3, 4, 5, 6\}$$

25.

Difficulty : Medium

Topics :

Binomial Distribution,

$$n = 4$$

$$p = \frac{2}{6} = \frac{1}{3}$$

$$q = \frac{4}{6} = \frac{2}{3}$$

X = Number on die is perfect square.

$$P(X=0) = {}^4C_0 \left(\frac{1}{3}\right)^0 \left(\frac{2}{3}\right)^4 = \frac{16}{81}$$

$$P(X \geq 1) = 1 - P(X=0) = 1 - \frac{16}{81} = \frac{65}{81}$$

26.

Difficulty : Medium

Topics :

Application of derivatives,

$$y^2 = ax^3 + b$$

$$2y\frac{dy}{dx} = a3(x^2)$$

$$\left.\frac{dy}{dx}\right|_{(2,3)} = \frac{a(3)(2)^2}{2(3)} = 2a = \text{Slope of tangent Given tangent}$$

$$\therefore\ m = 4$$

$$\therefore\ 2a = 4 \Rightarrow a = 2$$

$$y = 4x - 5 = mx + c$$

$(2,3)$ lies on curve $y^2 = ax^3 + b$

$$(3)^2 = a(2)^3 + b$$

$$9 = 8a + b$$

$$9 - 16 = b$$

$$b = -7$$

$$\therefore 7a + 2b$$

$$7(2) + 2(-7)$$

$$= 14 - 14$$

$$= 0$$

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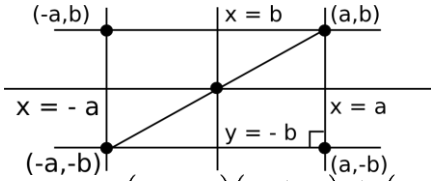
27.

Difficulty : Easy

Topics : Circles,

Eqn. of circle



$$\therefore \quad (x-a)(x+a)+(y-b)(y+b)=0$$

$$x^2-a^2+y^2-b^2=0$$

$$x^2+y^2=a^2+b^2$$

28.

Difficulty : Easy

Topics :

Application of derivatives,

$$f(x)=x\log x$$

$$f'(x)=x\times\frac{1}{x}+\log x\times 1$$

$$\therefore f'(x)=1+\log x$$

To be min

$$f'(x)=0$$

$$1+\log x=0$$

$$\log_e x=-1$$

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

also $f''(x) = \frac{1}{x}$

$$\therefore f''\left(\frac{1}{e}\right) = \frac{1}{1/e} = e > 0$$

$\therefore f(x)$ is minimum

$$f(1/e) = \frac{1}{e}\log\frac{1}{e} = \frac{-1}{e} = \frac{-1}{e}$$

29.

Difficulty : Medium

Topics :

Binomial Distribution,

$$V(X) = 10 \times 0.4 \times 0.6 = 2.4 \qquad E(X) = 10 \times 0.4 = 4$$

$$X \sim B(n,p); n = 10, p = 0.4 \therefore q = 0.6 E(X^2) = ?$$

$$V(X) = npq \quad E(X) = np$$

also

$$\therefore V(X) = E(X^2) - (E(X))^2$$

$$2.4 + 4^2 = E(X^2)$$

$$E(X^2) = 18.4$$

30.

Difficulty : Easy

Topics : Differential Equation

Let

$$x + y = V$$

$$1 + \frac{dy}{dx} = \frac{dv}{dx}$$

$$\frac{dy}{dx} = \frac{dv}{dx} - 1$$

$$\therefore \frac{dv}{dx} - 1 = \cos V$$

$$\frac{dv}{dx} = 1 + \cos V$$

$$\frac{dv}{dx} = 2\cos^2 \frac{V}{2}$$

$$\int \frac{dv}{\cos^2 \frac{V}{2}} = 2\int dx$$

$$\int \sec^2 \left(\frac{V}{2}\right) dv = 2x + C$$

$$2\tan\left(\frac{V}{2}\right) = 2x + C$$

$$\therefore 2\tan\left(\frac{x+y}{2}\right) = 2x + C$$

$$\therefore \tan\left(\frac{x+y}{2}\right) = 2x + C$$

$$\therefore \tan\left(\frac{x+y}{2}\right) = 2x + C/2$$

$$\therefore \tan\left(\frac{x+y}{2}\right) = x + C$$

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31.

Difficulty : Medium

Topic: Probability,

$$n(S) = \frac{8!}{4!3!}$$

$$n(A) = \frac{6!}{4!}$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{6!/4!}{8!/4!\ 3i} = \frac{6! \times 3!}{8!}$$

$$P(A) = \frac{6! \times 6^3}{8 \times 7 \times 6!} = \frac{3}{28}$$

32.

Difficulty : Easy

Topics :

Sequence & Series,

$$S_n = (10 - 1 + 100 - 1 + 1000 - 1 + ...)$$

$$S_n = (10 + 100 + 1000 + ...) - (1 + 1 + 1....)$$

$$S_n = 10\left(\frac{10^n - 1}{10 - 9}\right) - n$$

$$S_{10} = 10\left(\frac{10^{10} - 1}{9}\right) - 10$$

$$S_{10} = 10\left(\frac{10^{10} - 1}{9} - 1\right)$$

$$S_{10} = 10\left(\frac{10^{10} - 1 - 9}{9}\right)$$

$$S_{10} = 10\left(\frac{10^{10} - 10}{9}\right)$$

$$S_{10} = \frac{100}{9}\left(10^9 - 1\right)$$

33.

Difficulty : Easy

Topics : Factorization,

$$A+B+C=\pi$$
$$A+B=\pi-C$$
$$\cot(A+B)=\cot(\pi-C)$$
$$\frac{\cot A\cot B-1}{\cot A+\cot B}=-\cot C$$
$$\cot A\cot B-1=-\cot A\cot C-\cot B\cot C$$
$$\cot A\cot B+\cot B\cot C+\cot A\cot C=1$$

34.

Difficulty : Easy

Topics :

Indefinite integration,

$$I=\int\frac{dx}{\sqrt{4^2-(3x)^2}}$$
$$I=\frac{1}{3}\sin^{-1}\left(\frac{3x}{4}\right)+C$$
$$A+B=\frac{1}{3}+\frac{3}{4}=\frac{4+9}{12}=\frac{13}{12}$$

35.

Difficulty : Easy

Topics :

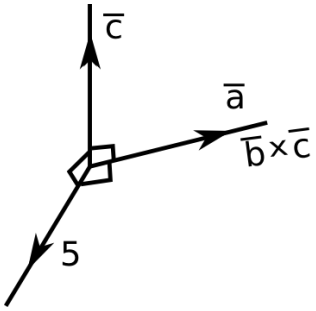
Indefinite integration,

$$I=\int e^x\left(\frac{2+2\sin x\cos x}{2\cos^2 x}\right)dx$$
$$I=\int e^x(\tan x+\sec^2 x)dx$$
$$I=e^x\tan x+C$$

36.

Difficulty : Difficult

Topics : Vectors,



$|\bar{a}| = 1\ , |\bar{b}| = 2,\ |\bar{c}| = 3$

$= \bar{a}.\bar{b} = 0 = \bar{b}.\bar{c} = \bar{c}.\bar{a}$

$= [(\bar{a} + \bar{b} + \bar{c}) \times (\bar{b} - \bar{a})].\bar{c}$

$= [\bar{a} \times \bar{b} - 0 + 0 - \bar{b} \times \bar{a} + \bar{c} \times \bar{a}].\bar{c}$

$= [2(\bar{a} \times \bar{b}).\bar{c} + (\bar{c} \times \bar{b}).\bar{c} - (\bar{c} \times \bar{a}).\bar{c}]$

$= 2(\bar{a} \times \bar{b}).\bar{c} + 0 - 0$

$= 2[\bar{a}\ \bar{b}\ \bar{c}]$

$= 2\bar{a}.(\bar{b} \times \bar{c})$

$= 2|\bar{a}||\bar{b} \times \bar{c}| \cos O^\circ$

$= 2|\bar{a}|\ |\bar{b}|\ |\bar{c}| \sin\theta$

$= 2(1)\ (2)\ (3) \sin\dfrac{\pi}{2}$

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37.

Difficulty : Medium

Topics :

Three
Dimensional
Geometry,
Vectors,

drs of PQ $a_1 = 4 - 3 = 1$

$b_1 = 5 - y$

$c_1 = x - 4$

drs of PR $a_2 = 5 - 4 = 1$

$b_2 = 8 - 5 = 3$

$c_2 = 0 - x = -x$

as P - Q - R collinear

$\frac{1}{1} = \frac{5-y}{3}$ and $\frac{1}{1} = \frac{x-4}{-x}$

$3 = 5 - y$ $\quad -x = x - 4$

$y = 2$ $\quad x = 2$

$x + y$

$2 + 2 = 4$

38.

Difficulty : Medium

Topics :

Pair of straight lines,

$ax^2 + 2hxy + by^2 = 0$

$$m_1 + m_2 = \frac{-2h}{b} \quad \text{.....(1)}$$

$$m_1.m_2 = \frac{a}{b} \quad \text{.....(2)}$$

$$m_1 = 2m_2 \quad \text{.....(3)}$$

Put (3) in (1)

$$3m_2 = \frac{-2h}{b}$$

$$m_2 = \frac{-2h}{3b}$$

Put (3) in (2)

$$2m_2.m_2 = \frac{a}{b}$$

$$2(m_2)^2 = \frac{a}{b}$$

$$\therefore 2\left(\frac{-2h}{3b}\right)^2 = \frac{a}{b}$$

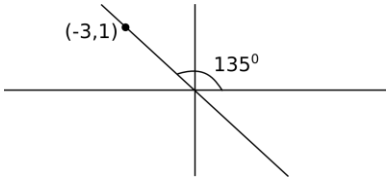
$$\therefore 8h^2 = 9ab.$$

39.

Difficulty : Easy

Topics :

Pair of straight lines,



$$(y-1) = -1(x+3)$$

$$y - 1 = -x - 3$$

$$x + y - 1 + 3 = 0$$

$$x + y + 2 = 0$$

40.

Difficulty : Medium

Topics :

Mathematics,

Topic - Mathematical Logic

$$\sim (p \to q) = p \wedge \sim q$$

Hema gets above 95% marks but she does not get admission in good college.

41.

Difficulty : Easy

Topics :

Continuity Differentiability & Derivatives,

$$\lim_{x \to 0} x^2 + \alpha = \lim_{x \to 0} 2\sqrt{x^2+1} + \beta$$

$$\alpha = 2 + \beta \ldots\ldots(1)$$

$$f(x) = x^2 + \alpha; x \geq 0$$

$$f\left(\frac{1}{2}\right) = \frac{1}{4} + \alpha$$

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

$$\frac{7}{4} = \alpha \ldots\ldots\ldots(2)$$

$$\frac{7}{4} - 2 = \beta = -\frac{1}{4} \ldots\ldots(3)$$

$$\alpha^2 + \beta^2 = \frac{49}{16} + \frac{1}{16} = \frac{50}{16} = \frac{25}{8}$$

42.

Difficulty : Medium

Topics :

Differentiation,

$$y = (\tan^{-1} x)^2$$

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

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

$$(1+x^2)\frac{d^2y}{dx^2} + \frac{dy}{dx}(2x) = \frac{2}{1+x^2}$$

$$(1+x^2)^2\frac{d^2y}{dx^2} + 2x(x^2+1)\frac{dy}{dx} = 2$$

43.

Difficulty : Medium

Topics :

Pair of straight lines,

As y^2 is abscent in given equation

$\therefore$ first line is $5x + y - 1 = 0$ and second is $ax + c = 0$

$$(5x + y - 1)(ax + c) = 0$$

$$5ax^2 + 5cx + axy + cy - ax - c = 0$$

$$5ax^2 + axy + x(5c - a) + cy - c = 0$$

Given equation $5x^2 + xy - ky - 2y + 2 = 0$

$\therefore \ a = 1; c = -2$

$\therefore \ -k = 5c - a$

$-k = 5(-2) - 1$

$-k = -10 - 1$

$\boxed{K = 11}$

44.

Difficulty : Medium

Topics :

Determinants & Matrices,

$(A^2 - 5A)A^{-1}$

$= A^2 \cdot A^{-1} - 5AA^{-1}$

$= A - 5I$

$= \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix} - \begin{bmatrix} 5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

$= \begin{bmatrix} -4 & 2 & 3 \\ -1 & -4 & 2 \\ 1 & 2 & -1 \end{bmatrix}$

45.

Difficulty : Medium

Topics :

LINES AND ANGLES,

$\therefore \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -2 & 1 \\ 1 & -2 & 2 \end{vmatrix} = -2\hat{i} - 3\hat{j} - 2\hat{k}$

$\therefore$ drs ofline

$a = -2 \;\; b = -3 \;\; c = -2$

or

$a = 2 \;\; b = 3 \;\; c = 2$

Equation of

Line $\dfrac{x-3}{2} = \dfrac{y+1}{3} = \dfrac{z-2}{2}$

46.

Difficulty : Medium

Topics :

Random Variables & its Probability Distribution,

$H \;\; H \;\; H - 3H$ and $0T$

$H \;\; H \;\; T - 2H$ and $1T = |n(H) - n(T)| = 1$

$H \;\; T \;\; H - 2H$ and $1T = |n(H) - n(T)| = 1$

$H \;\; T \;\; T - 1H$ and $2T = |n(H) - n(T)| = 1$

$T \;\; H \;\; H - 2H$ and $1T = |n(H) - n(T)| = 1$

$T \;\; H \;\; T - 2T$ and $1H = |n(H) - n(T)| = 1$

$T \;\; T \;\; H - 2T$ and $1H = |n(H) - n(T)| = 1$

$T \;\; T \;\; T - 3T$

$P(X = 1) = \dfrac{6}{8} = \dfrac{3}{4}$

47.

Difficulty : Easy

Topics :

Trigonometrical ratios of Compound angles,

$$2\left(\sin\theta \times \frac{1}{3} + \cos\theta \times \frac{\sqrt{3}}{2}\right) = \cos\theta \times \frac{\sqrt{3}}{2} + \sin\theta \times \frac{1}{2}$$

$$2\sin\theta + 2\sqrt{3}\cos\theta = \sqrt{3}\cos\theta + \sin\theta$$

$$\sin\theta = -\sqrt{3}\cos\theta$$

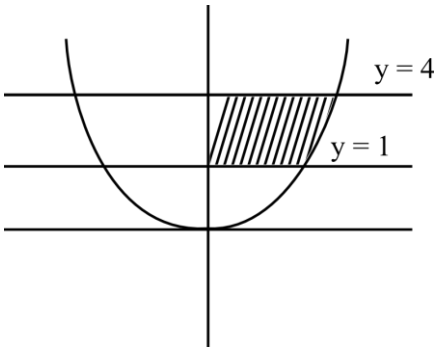
$$\tan\theta = -\sqrt{3}$$

48.

Difficulty : Easy

Topics :

Definite integration,



$$A = \int_1^4 x\,dy = 2\int_1^4 \sqrt{y}\,dy$$

$$A = 2\left(\frac{y^{3/2}}{3/2}\right)_1^4$$

$$A = \frac{4}{3}(8-1) = \frac{4}{3}(7) = \frac{28}{3}$$

49.

Difficulty : Medium

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Topics :

ContinuityDifferentiability & Derivatives,

$$f(0) = \lim_{x \to 0} \frac{e^{x^2} - cosx}{x^2}$$

$$\lim_{x \to 0} \frac{e^{x^2} - 1}{x^2} + \lim_{x \to 0} \frac{1 - cosx}{x^2}$$

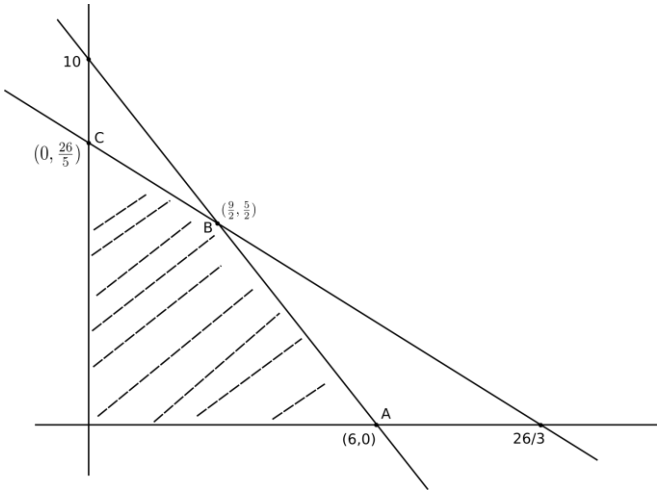
$$= 1 + \frac{1^2}{2} = \frac{3}{2}$$

50.

Difficulty : Easy

Topics :

Linear Programming,



$$3x + 5y = 26 \ldots (i) \times 5$$

$$5x + 3y = 30 \ldots (ii) \times 3$$

$$15x + 25y = 130$$

$$15x + 9y = 90$$

$$16y = 40$$

$$y = \frac{40}{16} = \frac{5}{2}$$

$$\therefore 3x + \frac{5 \times 5}{2} = 26$$

$$3x = 26 - \frac{25}{2}$$

$$x = \frac{9}{2}$$

$$z = 2x + y$$

$$ZA = 2 \times 6 + 0 = 12$$

$$ZB = 2 \times \frac{9}{2} + \frac{5}{2} = 9 + 2.5 = 11.5$$

$$ZC = 2 \times 0 + \frac{26}{5} = \frac{26}{5} = 5.2$$

at $x = 6$ and $y = 0$