~~मार्च~~. Solution of Set D.

Solution By Suhag Kariya & his students
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~~Q. 31~~.

Q.31. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three non zero vectors,-----

Sol.: 31(3) $(\vec{a}\times\vec{b})\times\vec{c} = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$ using formula

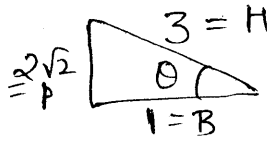
$(\vec{c}\cdot\vec{a})\vec{b} - (\vec{c}\cdot\vec{b})\vec{a} = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a} + 0\vec{b}$

coeff of $\vec{b}$: $\vec{c}\cdot\vec{a} = 0$

coeff of $\vec{a}$: $\vec{c}\cdot\vec{b} = \frac{1}{3}|\vec{b}||\vec{c}|$

$|b||c|\cos\theta = \frac{1}{3}|b||c|$

$\cos\theta = \frac{1}{3} = \frac{B}{H}$



$\sin\theta = \frac{2\sqrt{2}}{3}$

Q.32. Let O be the vertex of Q -----

Sol. 32(2) $x^2 = 8y$

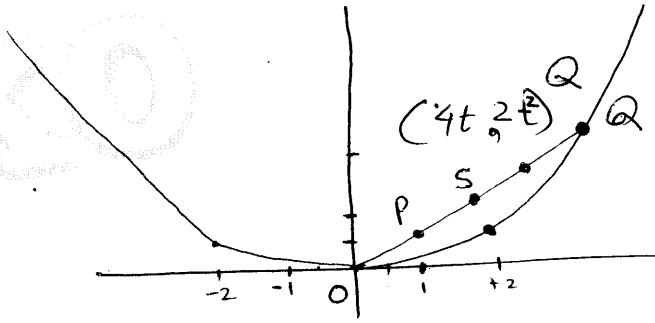
$S \to (2t, t^2)$

$P \to (t, \frac{t^2}{2})$

$h \quad k$

$K = t^2/2 \longrightarrow 2K = t^2 = h^2$

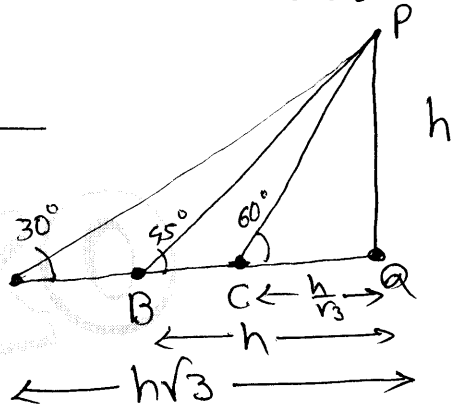
$2y = x^2$



P.T.O.

Q.33. If the angles of elevation of the top.....

Sol.: Short Trick (उन्नयन - ऊंचाई Concept) Class 10 Que
33(3) Class room.



$$\frac{AB}{BC} = \frac{AQ-BQ}{BQ-CQ} = \frac{h\sqrt{3}-h}{h-\frac{h}{\sqrt{3}}}$$

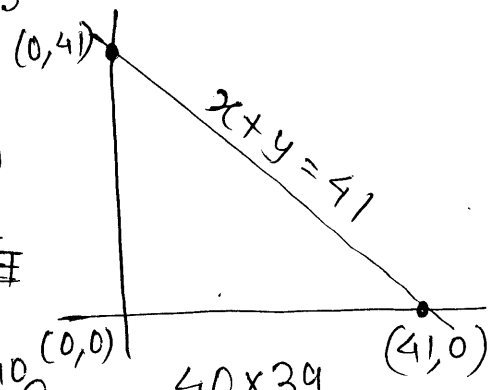
$$= \frac{(\sqrt{3}-1)h}{(\sqrt{3}-1)h/\sqrt{3}}$$

$$= \sqrt{3}:1$$

Q.34. The number of points, having both.....

Sol. Que of Short trick class at Teko
34(2)

$x+y<41$ [natural solution]
$x+y+I=38$
formula $n+p-1C_{p-1}$



$38+3-1$

$C_{3-1} = {}^{40}C_2 = \frac{40\times39}{2}$

$= 20\times39$

$= 780$

Q.35. The equation of the plane containing the line $2x-5y+z=3$, ...

Sol. Family of plane
35(1) $(-3+2x-5y+z)+\lambda(x+y+4z-5)=0$

$x(2+\lambda)+y(-5+\lambda)+z(1+4\lambda)+(-3-5\lambda)=0$

$\frac{2+\lambda}{1} = \frac{-5+\lambda}{3} = \frac{1+4\lambda}{6} \Rightarrow \lambda = \frac{-11}{2}$

$\lambda=\frac{-11}{2}$

$x\left(\frac{-7}{2}\right)+y\left(\frac{-21}{2}\right)+z\left(\frac{-42}{2}\right) = \frac{-49}{2} \Rightarrow x+3y+6y=7$

P.T.O

Q36. Let A & B be two sets containing. ----

Sol. it is class room practice que also in JEE Main 2013

36(3) $n(A) = 4$

$n(B) = 2$

number of elements in $A \times B$

$n(A \times B) = 8$

Total number of subsets

$= 2^8$

$= 256$

Subsets containing less than 3 elements

$= {}^8C_0 + {}^8C_1 + {}^8C_2$

$= 1 + 8 + 28$

$= 37$

so number of subsets having less than 3 elements

$= 256 - 37$

$= 219.$

Q.37. locus of the image of the point (2,3)-----

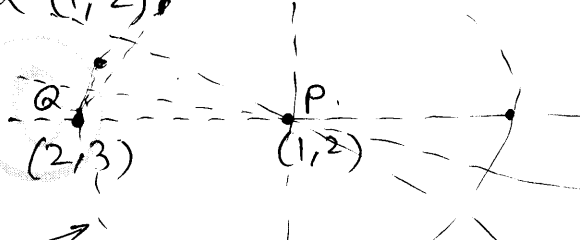
Sol. it is family of line $(2x - 3y + 4) + k(x - 2y + 3) = 0$

37(A) and all line passes through (1,2).

37(1) So required locus is

Circle with Centre P(1,2)

& radius $PQ = \sqrt{1^2 + 1^2} = \sqrt{2}$



Q.38. $\lim_{x \to 0} \frac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x}$

138(1) $\lim_{x \to 0} \frac{2\sin^2 x (3+1)}{x (4x)}$

$\lim_{x \to 0} \frac{2 \cdot x^2 \cdot 4}{4 \cdot x^2} = 2$

Class room que & JEE Main 2013 que apply extra laugage Concept and covert $\tan 4x = 4x$. & $\sin x = x$.

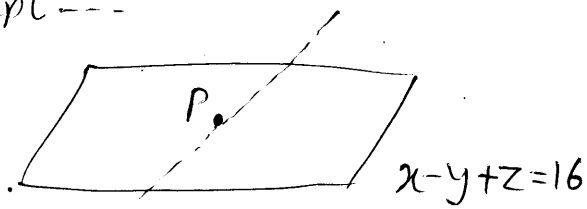
P.T.O.

ARTH.

Que 39 The distance of the point (1,0,2) from the,----

Sol.: Class room ques concept---

39(2) $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12} = \lambda$



$x = 3\lambda + 2$
$y = 4\lambda - 1$
$z = 12\lambda + 2$ } P

So P will satisfy the plane

$(3\lambda+2) - (4\lambda-1) + (12\lambda+2) = 16$

$11\lambda + 5 = 16$

$11\lambda = 11$

$\lambda = 1$

So P (5, 3, 14)

Q (1,0,2)

$PQ = \sqrt{4^2 + 3^2 + 12^2} = 13$

Q40. The sum of coefficients of integral ----

Sol. Class 11 concept Class room ques.

40(3) $(1-2\sqrt{x})^{50} + (1+2\sqrt{x})^{50} = 2\left[{}^{50}C_0 + {}^{50}C_2 \cdot (2\sqrt{x})^2 + {}^{50}C_4 (2\sqrt{x})^4 + \cdots\right]$

$x \to 1$ Any

$(1-2)^{50} + (1+2)^{50} = 2[\text{Sum of integral Powers of } x]$

$(1) + (3)^{50} = 2(\text{Any})$

$\frac{3^{50}+1}{2} = \text{Any.}$

P.T.O.

Q.41. The sum of first 9 terms ----

Sol. Similar 2 ques discussed in 3days ShortTrickless

41(4) $S_n = \frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \cdots$

$T_n = \frac{\left(\frac{n(n+1)}{2}\right)^2}{n^2} = \frac{1}{4}(n+1)^2$

So req value. $\frac{1}{4}\left[2^2+3^2+4^2+\cdots+10^2\right]$

$+1 \qquad -1$

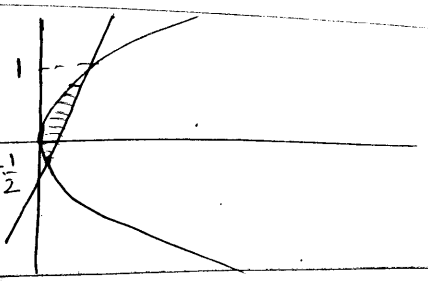
$\frac{1}{4}\left[\frac{n(n+1)(2n+1)}{6} - 1\right]$

$96 = \frac{384}{4} \leftarrow\leftarrow = \frac{1}{4}\left[\frac{10(11)(21)}{6} - 1\right] =$ ~~4×6~~

Q.42. The area (in sq units) ----

Sol. Class room que AUC.

42(2) $A = \int_{-1/2}^{1} (y_2 - y_1)\,dy = \int_{-1/2}^{1} \left(\frac{y+1}{4} - \frac{y^2}{2}\right) dy = \frac{9}{32}$



Q.43. The set of all value of λ ------

Sol. Very easy $\Delta = 0$

43(1) $\begin{vmatrix} 2-\lambda & -2 & 1 \\ 2 & -3-\lambda & 2 \\ -1 & 2 & -\lambda \end{vmatrix} = 0$ → $(\lambda-1)^2 \cdot (3+\lambda) = 0$

$\lambda = 1$ & $\lambda = -3$

Two values.

P.T.O.

Q44. A complex number z is said to be,----

Sol. Class room question (Similar que in M P Board Schol book)

44(1) $\left(\frac{z_1-2z_2}{2-z_1\bar{z}_2}\right)\left(\frac{\bar{z}_1-2\bar{z}_2}{2-\bar{z}_1 z_2}\right)=1$

$$|z_1|^2-2z_1\bar{z}_2-2z_2\bar{z}_1+4|z_2|^2=4-2\bar{z}_1z_2-2z_1\bar{z}_2+|z_1|^2|z_2|^2$$

$$|z_1|^2|z_2|^2-4|z_2|^2-|z_1|^2+4=0$$

$$|z_1|^2(|z_2|^2-1)-4(|z_2|^2-1)=0$$

So $|z_1|^2=4$, $|z_1|=2$

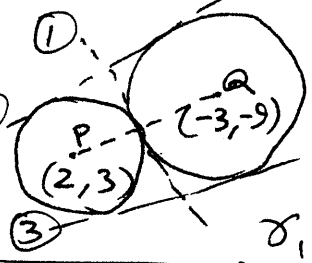
Q45. The number of common-- it is circle. centre = (0,0) rad = 2

Sol. Very easy paper, it is also from our class room

45(1) $r_1+r_2=d$ Touching ①.

LHS $r_1+r_2=3+8=13$

RMS $d=PQ=\sqrt{5^2+12^2}=13$



$r_1=\sqrt{2^2+3^2+12}=5$

$r_2=\sqrt{(-3)^2+(-9)^2-26}=8$

Q.46. The number of integers greater than 6000....

Sol. 4 digits

46(4) 

6, 7, 8

$1\times4\times3\times2=24\times3=72$

Ans $=72+120=192$

5 digit all $5!=120$

Q.47. Let $y(x)$ be the solution of the diff. eq.---

Sol. Class room que $\frac{dy}{dx}+\frac{1}{x\ln x}y=2$

47(1) I.F. $=e^{\int\frac{1}{x\ln x}dx}=e^{\ln\ln x}=\ln x$

Sol of diff. eq

$y.\ln x=\int 2.\ln x\,dx$

$y\ln x=2x\ln(x/e)+C$

$x\to1, y\to0, C\to2$

$y=\frac{2x\ln(x/e)+2}{\ln x}$ $x\to e$

$y(e)=\frac{2}{1}=2$

P.T.O.

Q.48. If $A =$ ---------

Sol.: $AA^T = 9I \longrightarrow$

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}\begin{bmatrix} 1 & 2 & a \\ 2 & 1 & 2 \\ 2 & -2 & b \end{bmatrix} = \begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

48(2)

$a+4+2b=0$

Check only for above option zero.

$(-2,-1)$

Q.49. If m is the AM of two....

Sol. Suhag Short Trick (S.S.T.)

49(4) 2, 4, 8, 16, 32

l G_1 G_2 G_3 n

$$m = \frac{l+n}{2} = 17$$

$$G_1^4 + 2\cdot G_2^4 + G_3^4$$

$$4^4 + 2\cdot 8^4 + 16^4$$

$$4^4\left(1 + 2\cdot 2^4 + 4^4\right)$$

$$256\,(1 + 32 + 256)$$

$$(256)\times(289)$$

$$4 \times 4^3 \times 17^2$$

$$4 \times 64 \times m^2$$

$$4 \times 2 \times 32 \times m^2$$

$$4 \times l \times n \times m^2$$

Q.50. The negation of $\sim s \vee (\sim r \wedge s)$

50(2) $s \wedge r$

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

Q.51. The integral $\int \frac{dx}{x^2(x^4+1)^{3/4}} = \int \frac{dx}{x^2 x^3 (1+x^{-4})^{3/4}}$

Sol. Kutuputus Concept. Classroom que.

51(2) $\int \frac{x^{-5}dx}{(1+x^{-4})^{3/4}}$ Let $1+x^{-4} = t$

$-4x^{-5} = \frac{dt}{dx} \rightarrow x^{-5}dx = -\frac{1}{4}dt$

$$-\frac{1}{4}\int \frac{dt}{t^{3/4}} = -\frac{1}{4}\int t^{-3/4}dt = -\frac{1}{4}\frac{t^{1/4}}{1/4} = -\left[1+x^{-4}\right]^{1/4} + c$$

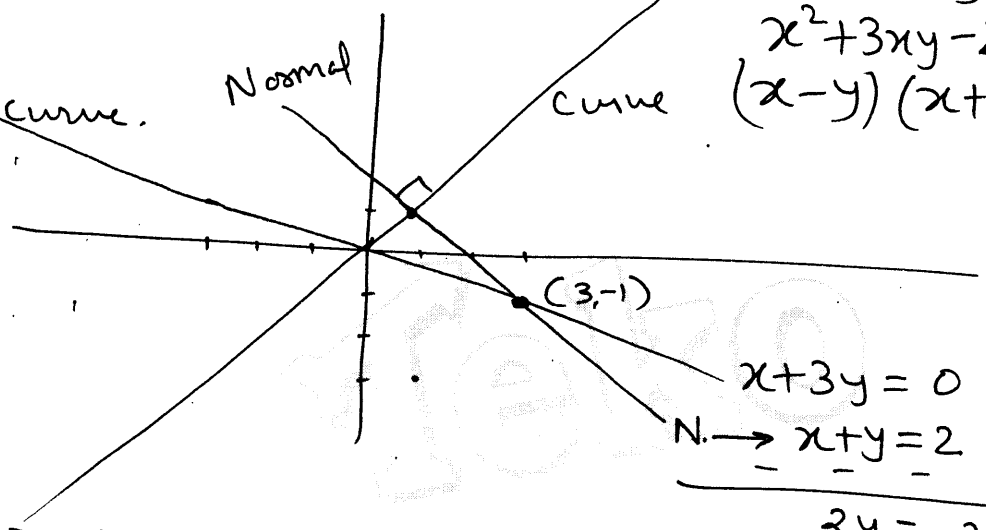
P.T.O. $= -\left[\frac{x^4+1}{x^4}\right]^{1/4} + c$

Q.52 The normal to the curve $x^2+2xy-3y^2=0$

Sol. (2)

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

curve $(x-y)(x+3y)=0$



subtract

$2y=-2$

$y=-1$.

$x=-3y=3$

52(2) Meet the curve in IV quadrant at Point $(3,-1)$

Q.53 let $\tan^{-1}y=\tan^{-1}x+\tan^{-1}\left(\frac{2x}{1-x^2}\right)$

Sol. not special case

53(3) apply direct formula because $\rightarrow |x|<\frac{1}{\sqrt{3}}$

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

Q.54 If the function $g(x)$ - - - -

Sol. (3)

$$g(x)=\begin{cases}k\sqrt{x+1} & ;\ 0\le x\le 3\\ mx+2 & ;\ 3\le x\le 5\end{cases} \quad g'(x)=\begin{cases}\frac{k}{2\sqrt{x+1}} & ;\ x<3\\ m & ;\ 3<x\end{cases}$$

$g(3^-)=g(3^+)$

$2k=3m+2$

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

$5k=8$

$k=8/5$

$g'(3^-)=g'(3^+)$

$\frac{k}{4}=m$

$\frac{8/5}{4}=m=\frac{2}{5}$

$k+m=\frac{10}{5}=2$

P.T.O.

Q.55. The mean of the data set ----

Sol. Similar que in classroom also in book R.S. Agrawal

55(2) $\frac{\Sigma x_i}{n} = 16$ $\Sigma x_i = 16 \times 16 = 256$

now 16 is subtracted and 3, 4, 5 are added.

so and $\Sigma x_i = 256 - 16 + 3 + 4 + 5 = 252$.

$n = 16 - 1 + 3 = 18$

$\bar{x} = \frac{252}{18} = 14$

Q56. The integral. $I = \int_2^4 \frac{\ln x^2}{\ln x^2 + \ln(x-6)^2}$

Sol. 56(1)

$x \to 2+4-x \to 6-x$

$I = \int_2^4 \frac{\ln(x-6)^2}{\ln(x-6)^2 + \ln x^2}$

$2I = \int_2^4 1\,dx = [x]_2^4 = [4-2] = 2$

$I = 1.$

Q.57 let α and β be the roots of equation

Sol. old JEE que.

$x^2 - 6x - 2 = 0 \begin{matrix}\alpha \\ \beta\end{matrix}$

$\alpha+\beta = 6, \alpha\cdot\beta = -2$

57(1)

$a_n = \alpha^n - \beta^n$

$a_{10} = \alpha^{10} - \beta^{10}$, $a_8 = \alpha^8 - \beta^8$, $a_9 = \alpha^9 - \beta^9$

$\frac{a_{10} - 2a_8}{2a_9} = \frac{\alpha^{10} - \beta^{10} - 2(\alpha^8 - \beta^8)}{2(\alpha^9 - \beta^9)}$

$= \frac{\alpha^{10} - \beta^{10} + \alpha\beta(\alpha^8 - \beta^8)}{2(\alpha^9 - \beta^9)}$

$= \frac{\alpha^{10} - \beta^{10} + \alpha^9\beta - \alpha\cdot\beta^9}{2(\alpha^9 - \beta^9)}$

$= \frac{(\alpha^9 - \beta^9)(\alpha+\beta)}{2(\alpha^9 - \beta^9)} = \frac{6}{2} = 3$

P.T.O.

श्रीराम.

Q.58 let $f(x)$ be a polynomial of degree four ----

Sol. $f'(1)=0$ & $f'(2)=0$ [Good level question].

58(1) $\lim_{x\to 0} \frac{x^2+f(x)}{x^2} = 3$ due to $\frac{0}{0}$; $f(0)=0$

$\lim_{x\to 0} \frac{2x+f'(x)}{2x} = 3$ L' Hospital $\frac{0}{0}$ $f'(0)=0$

$\lim_{x\to 0} \frac{2+f''(x)}{2} = 3$

$f''(0) = 6-2=4$

$f'(x) = a.x.(x-1)(x-2) = ax(x^2-3x+2)$

$f'(x) = a[x^3-3x^2+2x]$. integration

$f(x) = a\left[\frac{x^4}{4} - x^3 + x^2\right] + C$ but $C=0$ $f(0)=0$

$f(x) = a\left[\frac{x^4}{4} - x^3 + x^2\right]$

$f(2) = a\left(\frac{2^4}{4} - 2^3 + 2^2\right) = a(0) = 0$.

Q.59. The area. (in sq. unit)

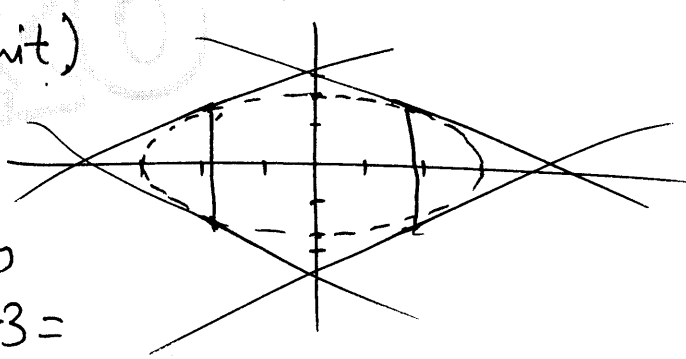
Sol. Suhag Short Trick.

59(2) Req area is greater than area of ellipse

$\pi ab = \pi . 3.\sqrt{5} = \frac{22}{7}\times 3\times 2.3 =$

$= 3.1\times 6.9 = 21.07$ Mean $\frac{27}{2}$, $\frac{27}{4}$, 18 are smaller

So Our answer (27)



P.T.O.

Q.60. Of 12 identical balls are to be placed in —

SOL. $\frac{{}^{12}C_3 (2^9)}{3^{12}} = \frac{{}^{4}\cancel{12} \cdot 11 \cdot {}^{5}\cancel{10}}{\cancel{3} \cdot 2 \cdot 1} \times \frac{2^9}{3^{12}}$

$= 4 \times 55 \times \frac{2^9}{3^{12}} = \frac{55 \times 2^{11}}{3 \times 3^{11}}$

$= \frac{55}{3}\left(\frac{2}{3}\right)^{11}$

60(3)

it may be mistake in ques. here identical word not to be used.

Very easy question Paper } Level Below Avg.
IITJEE Main 2015
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Topic	Num. of Que.		Topic	Numer
1) Vectors	1	Class 12	15) Complex Num	1 Class 11
2) 2D	5+1 = 6	Class 11		
3) 3D	2	Class 12		30.
4) Seq & Ser	1+1 = 2	Class 11		
5) quad. Eq.	1	Class 11		
6) Integration Full	4	Class 12		
7) Diff Cal. full	3	Class 12		
8) Binomial Th.	1	Class 11		
9) P&C & Probabilty	2	Class 11, 12		
10) Trigonometry full	2	Class 11, 12		
11) M.R.	1	Class 11		
12) Sets	1	Class 11		
13) Statics	1	Class 11		
14) Det & Mat.	2	Class 11, 12 (CBSE, MP)		

Short Trick Batch for Advanced 2015 from 12th April and Second Batch from Next Day

Score declared by JEE Main 15