CLASS XII SESSION 2020-21

PRACTICE PAPER IV

SUBJECT : MATHEMATICS

MARKING SCHEME/VALUE POINTS (THEORY)

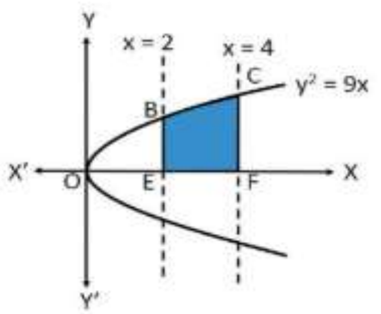
Sr No	Objective type Question Section I Value points	Marks
1	$\int \frac{cos\sqrt{x}}{\sqrt{x}}.dx$ Let $\sqrt{x}$ =t=> I=2sin$\sqrt{x}$+C	1
2	(1,2)∈R, (2,1)∈R but (1,1) $\notin R$ therefore R is not transitive	1
3	1 OR k=17	1
4	$A^{-1} = \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$	1
5	49	1
6	9 OR Scalar component of $\overrightarrow{AB}$=-7,6	1
7	1	1
8	Range ={-1,1}	1
9	1	1
10	27/2	1
11	Reqd d'cs are,$<\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}},\pm\frac{1}{\sqrt{3}}>$	1
12	Dr's of a line parallel to AB =1,-2.4	1
13	2/5	1
14	4 sq units	1
15	0.3	1
16	One- one	1
17	P(H)=$\frac{60}{100}$=0.60, P(E)=0.40, P(H∩E)=0.20	

	P(HUE)=P(H)+P(E)-P($H\cap E$)=0.60+0.40-0.20=0.80 (i)P($\bar{H}\cap\bar{E}$)=1-P(HUE)=1-0.80=0.20=$\frac{1}{5}$ ANS(C) (ii)P($\frac{E}{H}$)=$\frac{P(E\cap H)}{P(H)}$ =$\frac{0.20}{0.60}$=$\frac{2}{6}$=$\frac{1}{3}$ Ans(B) (iii)P($\frac{H}{E}$)= $\frac{P(H\cap E)}{P(E)}$=$\frac{0.20}{0.40}$=$\frac{1}{2}$ Ans(B) (iv)P($H\cap\bar{E}$)=P(H)-P($H\cap E$)=0.60-0.20=0.40=2/5 ANS (A) (v)P(Either Hindi or English)=P(HUE)= 0.80 =4/5 Ans (c)	1 1 1 1 1
18	(i)C (ii)C (iii)b (iv) b (v) c	1 1 1 1 1
19	$\tan^{-1}(x+1)+\tan^{-1}(x-1)=\tan^{-1}\frac{8}{31}$ Solution- $\tan^{-1}\left[\frac{x+1+x-1}{1-(x^2-1)}\right]=\tan^{-1}\frac{8}{31}$ $x^2-1<1 \Rightarrow x^2<2 \ldots\ldots\ldots\ldots\ldots\ldots..(1)$ $\frac{2x}{2-x^2}=\frac{8}{31}$ =>31x=8-4x^2 =>4x^2+31x-8=0 =>(4x-1)(x+8)=0 =>x=1/4 or x=-8	½ 1

	as$x^2 < 2\ from\ (1) => x = 1/4$	1/2
20	Siny=xsin(a+y)=> $\frac{siny}{\sin(a+y)} = x$ Differentiating both sides with respect to x we have $\frac{\sin(a+y)\,cosy\ \frac{dy}{dx} - sinycos(a+y)\frac{dy}{dx}}{sin^2(a+y)} = 1$ ⇨ $\frac{dy}{dx}\left[\frac{\sin(a+y-y)}{sin^2(a+y)}\right]$=1 ⇨ $\frac{dy}{dx} = \frac{sin^2(a+y)}{sina}$ OR f($\frac{\pi}{2}$)=3 $\lim_{x\to\frac{\pi}{2}} f(x) = \lim_{x\to\frac{\pi}{2}}\left(\frac{kcosx}{\pi-2x}\right)$ Let x=$\frac{\pi}{2} + t\ as\ x \to \frac{\pi}{2} => t \to 0$ =>k$\lim_{t\to 0}\frac{\cos\left(\frac{\pi}{2}+t\right)}{\pi-\pi-2t}$= k$\lim_{t\to 0}\frac{-\sin t}{-2t} = \frac{k}{2}x1 = \frac{k}{2}$ =>$\frac{k}{2}$=3=>k=6	½ 1/2 ½ ½ 1/2 1 1/2
21	Y=x^3 => $\frac{dy}{dx} = 3x^2$ But $\frac{dy}{dx} = y => x^3 = 3x^2$ $=> x^2\,(x-3) = 0 => x = 0{,}3$ (0,0) and (3,27) are the required points OR f(x)=log(1+x)-$\frac{2x}{2+x}$ clearly f(x) is defined in (-1,1) f'(x)=$\frac{1}{1+x}$-$\frac{4}{(2+x)^2}$=$\left(\frac{x}{2+x}\right)^2\left(\frac{1}{1+x}\right)$ f'(x)>0=>$\frac{1}{1+x}$>0=>x+1>0=>x>-1 ∴f(x) is an increasing function in (-1,1)	½ ½ 1 1 1

22	I=$\int_0^{\pi} \frac{4x}{1+cos^2x}$dx =$\int_0^{\pi} \frac{4(\pi-x)}{1+cos^2(\pi-x)}$dx=$4\pi \int \frac{dx}{1+cos^2x}$- I =>2 $\mathrm{I} = 4\pi \int \frac{dx}{1+cos^2x} = 4\pi.2\int_0^{\frac{\pi}{2}} \frac{dx}{1+cos^2x} =$ $\because f(\pi - x) = f(x)$ => I=$4\pi.\int_0^{\frac{\pi}{2}} \frac{dx}{1+cos^2x}$ Dividing numerator and denominator by cos^2x $\mathrm{I} = 4\pi.\int_0^{\frac{\pi}{2}} \frac{sec^2xdx}{sec^2x+1}$ =$4\pi \int_0^{\frac{\pi}{2}} \frac{sec^2xdx}{tan^2x+2}$ put tanx=t=>$sec^2xdx\ dt$ =$4\pi \int_0^{\infty} \frac{dt}{2+t^2}$ =4π$\frac{1}{\sqrt{2}}\tan^{-1}\frac{t}{\sqrt{2}}\Big]_0^{\infty}$=$\frac{4\pi}{\sqrt{2}}[\tan^{-1}\infty - \tan^{-1}0]$=$\frac{4\pi}{\sqrt{2}}.\frac{\pi}{2}$=$\sqrt{2}\,\pi^2$ OR $\mathrm{I} = \int \frac{x+2}{\sqrt{x^2+5x+6}}$dx =>x+2=A$\frac{d}{dx}(x^2+5x+6)+B$=>A=1/2,B=-1/2 $\therefore$ I=$\frac{1}{2}\int \frac{2x+5}{\sqrt{x^2+5x+6}}$dx-$\frac{1}{2}\int \frac{dx}{\sqrt{x^2+5x+6}}$ =$\sqrt{x^2+5x+6}$ -$\frac{1}{2}$log|(x+$\frac{5}{2}$)+$\sqrt{x^2+5x+6}$|+C	1 1 1 1 1
23	P(A)=$\frac{1}{2}$, P(B)=$\frac{1}{3}$ (I)P(Problem is solved=1-P($\bar{A} \cap \bar{B}$)=1-P($\bar{A}$)XP($\bar{B}$)=1-$\frac{1}{2}X\frac{2}{3}$=$\frac{2}{3}$ (ii)P(Exactly one can solve the problem)=P($\bar{A} \cap B$)+P(A∩ $\bar{B}$) =P($\bar{A}$)XP(B)+P(A)X P($\bar{B}$)=$\frac{1}{2}X\frac{1}{3}+\frac{1}{2}X\frac{2}{3}$=$\frac{1}{2}$	1 1
24	$\overrightarrow{a_1}$ =3$\hat{\imath}$+2$\hat{\jmath}$-4$\hat{k}$, $\overrightarrow{b_1}$ =$\hat{\imath}$+2$\hat{\jmath}$+2$\hat{k}$ $\overrightarrow{a_2}$ =5$\hat{\imath}$-2$\hat{\jmath}$ $\overrightarrow{b_2}$ =3$\hat{\imath}$+2$\hat{\jmath}$+6$\hat{k}$	

	$\overrightarrow{a_2}-\overrightarrow{a_1}$ =2$\hat{\imath}$-4$\hat{\jmath}$+4$\hat{k}$ $\overrightarrow{b_1}X\overrightarrow{b_2}$ =$\begin{vmatrix}\hat{\imath} & \hat{\jmath} & \hat{k}\\ 1 & 2 & 2\\ 3 & 2 & 6\end{vmatrix}$=$\hat{\imath}$(12-4)-$\hat{\jmath}$ (6-6) +$\hat{k}$ (2-6)=8$\hat{\imath}$-4$\hat{k}$ S D =$\left\|\frac{(\overrightarrow{a_2}-\overrightarrow{a_1}).(\overrightarrow{b_1}X\overrightarrow{b_2})}{\|\overrightarrow{b_1}X\overrightarrow{b_2}\|}\right\|$ =$\left\|\frac{2X8-0-4X4}{\sqrt{(8)^2+(-4)^2}}\right\|$=0	1 1
25	$\vec{a}$ =3$\hat{\imath}$+2$\hat{\jmath}$+3$\hat{k}$, $\vec{b}$ =$\hat{\imath}$+2$\hat{\jmath}$-2$\hat{k}$ ∴ $\vec{a}$+$\vec{b}$=4$\hat{\imath}$+4$\hat{\jmath}$+$\hat{k}$ $\vec{a}$-$\vec{b}$=2$\hat{\imath}$+5$\hat{k}$ Perpendicular vector=$\begin{vmatrix}\hat{\imath} & \hat{\jmath} & \hat{k}\\ 4 & 4 & 1\\ 2 & 0 & 5\end{vmatrix}$=20$\hat{\imath}-18\hat{\jmath}-8\hat{k}$ $\|\vec{r}\|$=$\sqrt{400+324+64}$ =$\sqrt{788}$ =2$\sqrt{197}$ $unit\ vector\ \hat{r}=\frac{10}{\sqrt{197}}\hat{\imath}-\frac{9}{\sqrt{197}}\hat{\jmath}-\frac{4}{\sqrt{197}}\hat{k}$	1 1
26	(1+x^2) $\frac{dy}{dx}+y=\tan^{-1}x$ =>$\frac{dy}{dx}$+$\frac{1}{1+x^2}$$y$=$\frac{\tan^{-1}x}{1+x^2}$ P=$\frac{1}{1+x^2}$ Q=$\frac{\tan^{-1}x}{1+x^2}$ I.F =$e^{\int\frac{dx}{1+x^2}}$=$e^{\tan^{-1}x}$ y. $e^{\tan^{-1}x}=\int\frac{\tan^{-1}x}{1+x^2}\ e^{\tan^{-1}x}\ dx$ Put $\tan^{-1}x=t$ $$\frac{1}{1+x^2}dx=dt$$ => y. $e^{\tan^{-1}x}$=$\int e^t.t.dt$ => y. $e^{\tan^{-1}x}$= t. e^t-$\int e^t.dt$ = te^t-e^t+C =>y. $e^{\tan^{-1}x}$=$(\tan^{-1}x-1).e^{\tan^{-1}x}$+C =>y=$\tan^{-1}x-1+C\ e^{-tan^{-1}x}$	½ 1/2 1

	OR $(x^2-1)\frac{dy}{dx}+2xy$=$\frac{2}{x^2-1}$ $$\frac{dy}{dx}+\frac{2x}{x^2-1}.y=\frac{2}{(x^2-1)^2}$$ P=$\frac{2x}{x^2-1}$ Q=$\frac{2}{(x^2-1)^2}$ I.F. =$e^{\int\frac{2x}{x^2-1}dx}$= $e^{\log(x^2-1)}$= x^2-1 y(x^2-1)=$\int\frac{2}{(x^2-1)^2}$.$(x^2-1)dx=2\int\frac{dx}{x^2-1}$ =2.$\frac{1}{2}$ $log\frac{x-1}{x+1}$ +C => y(x^2-1)= $log\left\|\frac{x-1}{x+1}\right\|$+C	
27	 Area bounded by $y^2=9x, x=2,$ $x=4$ *and x axis in first quardant* Required area =$\int_2^4 3\sqrt{x}$ dx =3X$\frac{2}{3}x^{\frac{3}{2}}]_2^4$=2X8-2X2$\sqrt{2}$=(16-4$\sqrt{2}$)Sq units	1 1

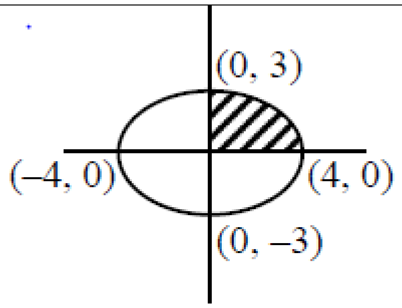
28	$A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ =>A=$\begin{bmatrix} 3 & -1 & 0 \\ 4 & 2 & 1 \end{bmatrix}$ B^T=$\begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ A-B^T =$\begin{bmatrix} 4 & -3 & -1 \\ 3 & 0 & -2 \end{bmatrix}$	½ $1\frac{1}{2}$
	SECTION IV	
29	A=R-$\left\{\frac{2}{3}\right\}$ f(x)=$\frac{4x+3}{6x-4}$,f(x) is defined for x≠ $\frac{2}{3}$ For one-one let $x_1, x_2 \in A\ such\ that$ f(x_1)= f(x_2)=> $\frac{4x_1+3}{6x_1-4} = \frac{4x_2+3}{6x_2-4}$ $24x_1x_2 - 16x_1 + 18x_2 - 12 = 24x_1x_2 + 18x_1 - 16x_2 - 12$ ⇨ $x_1 = x_2$ hence f(x) is one- one <u>ONTO :</u> Let y=$\frac{4x+3}{6x-4}$ =>x=$\frac{4y+3}{6y-4}$ Here x≠ $\frac{2}{3}$ If x=$\frac{2}{3}$ then$\frac{2}{3} = \frac{4y+3}{6y-4}$ =>12y+9=12y-8=>9=-8 which is wrong Thus every y has its pre image in A=R-$\left\{\frac{2}{3}\right\}$ for every x∈ A $\therefore f(x) is\ Onto$	 $1\frac{1}{2}$ $1\frac{1}{2}$

30	Y=log(x+$\sqrt{x^2+a^2}$) =>$\frac{dy}{dx}=\frac{1}{x+\sqrt{x^2+a^2}}$X[1+$\frac{2x}{2\sqrt{x^2+a^2}}$]=$\frac{1}{\sqrt{x^2+a^2}}$ =>$\sqrt{x^2+a^2}\frac{dy}{dx}$=1 =>$\sqrt{x^2+a^2}\frac{d^2y}{dx^{2.}}$+$\frac{2x}{2\sqrt{x^2+a^2}}\frac{dy}{dx}$=0 => $(x^2+a^2)\frac{d^2y}{dx^{2.}}$+x$\frac{dy}{dx}=0$	$1\frac{1}{2}$ $1\frac{1}{2}$
31	Let y=x^{sinx}+$(sinx)^{cosx}$ Y=u+v where u=x^{sinx} , => logu=sinxlogx v=$(sinx)^{cosx}$ =>$\frac{1}{u}\frac{du}{dx}$=cosx logx+$\frac{sinx}{x}$ =>$\frac{du}{dx}$ =x^{sinx}(cosx logx+$\frac{sinx}{x}$) Now v=$(sinx)^{cosx}$ =>logv=cosx.logsinx =>$\frac{1}{v}\frac{dv}{dx}$=-sinx.logsinx+$\frac{cosx}{sinx}$ .cosx =>$\frac{dv}{dx}=(sinx)^{cosx}$[-sinx.log sinx+cotx.cosx] Now y=u+v=>$\frac{dy}{dx}=\frac{du}{dx}+\frac{dv}{dx}$ =$(x)^{sinx}\left[cosx.logx+\frac{sinx}{x}\right]+(sinx)^{cosx}$[-sinx.log sinx+cotx.cosx] OR x=a($\theta-sin\theta$) , $y=a(1+cos\theta)$ $\frac{dx}{d\theta}$=a(1-cosθ) , $\frac{dy}{d\theta}$=-asinθ =>$\frac{dy}{dx}=\frac{-asin\theta}{a(1-cos\theta)}$=$\frac{-2sin\frac{\theta}{2}cos\frac{\theta}{2}}{2sin^2\frac{\theta}{2}}$=- $cot\frac{\theta}{2}$ $$\frac{d^2y}{dx^{2.}}=\frac{1}{2}cosec^2\frac{\theta}{2}.\frac{d\theta}{dx}=\frac{1}{2a(1-\cos\theta)}cosec^2\frac{\theta}{2}$$	$1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$

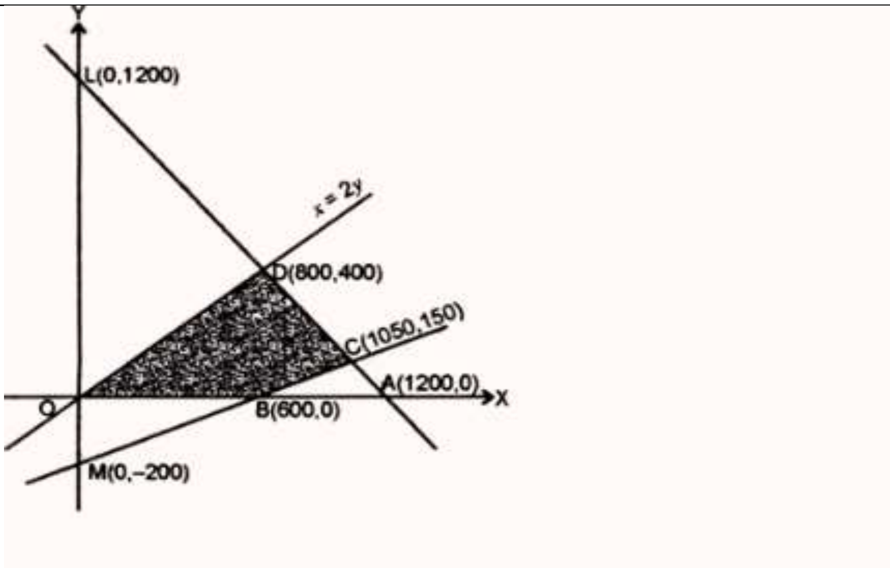
	=> $\frac{d^2y}{dx^2}$ = $\frac{1}{4a}\frac{cosec^2\frac{\theta}{2}}{sin^2\frac{\theta}{2}}$=$\frac{1}{4a}cosec^4\frac{\theta}{2}$	$1\frac{1}{2}$
32	(3xy+$y^2)dx + (x^2+xy)dy = 0$ =>$\frac{dy}{dx} = -\frac{(3xy+y^2)}{(x^2+xy)}$ Put y=vx =>$\frac{dy}{dx}$=v+x$\frac{dv}{dx}$ => v+x$\frac{dv}{dx} = -\frac{(3x.vx+v^2x^2)}{(x^2+x.vx)}$=> x$\frac{dv}{dx}$=$\frac{-3v-v^2}{1+v}$-v =$\frac{-3v-v^2-v-v^2}{1+v}$=$\frac{-4v-2v^2}{1+v}$ $\frac{1+v}{2v^2+4v}dv = \frac{-1}{x}dx$ Integrating both sides we get $\frac{1}{4}\ log\|v^2+2v\| = -log\|x\| + c$ $log\|v^2+2v\| = -logx^4$+ 4c $log\|v^2+2v\| + logx^4 = 4c$ $\frac{y^2+2xy}{x^2}.\ x^4$ = C $(y^2+2xy)x^2 = C$ OR (1+$x^2)dy + 2xydx = cotxdx, \quad x \neq 0$	$1\frac{1}{2}$ $1\frac{1}{2}$

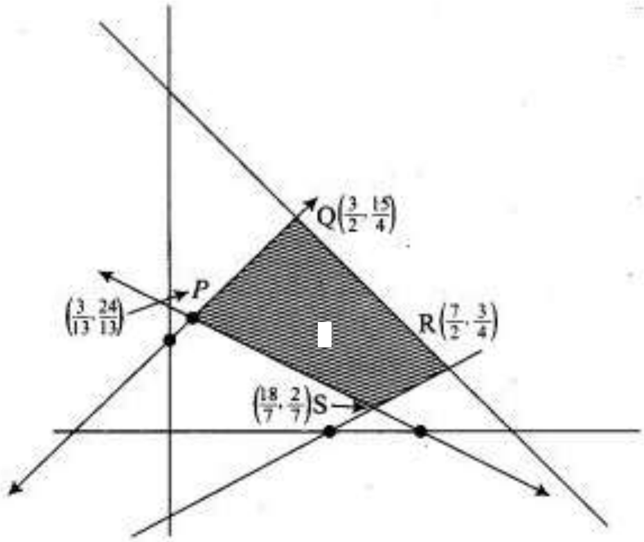
	$\frac{dy}{dx}=\frac{cotx}{1+x^2}-\frac{2x}{1+x^2}y=>\frac{dy}{dx}+\frac{2x}{1+x^2}y=\frac{cotx}{1+x^2}$ P=$\frac{2x}{1+x^2}$ $,Q=\frac{cotx}{1+x^2}$ I.F=$e^{\int\frac{2x}{1+x^2}dx}$=$e^{\log(1+x^2)}$= $(1+x^2)$ y.$(1+x^2)$=$\int\frac{cotx}{1+x^2}(1+x^2)\,dx$=$\int cotx\,dx$ =log sinx+C => y.$(1+x^2)=logsinx+C$	$1\frac{1}{2}$ $1\frac{1}{2}$
33	f(x)=sinx+cosx ,0$\leq x\leq 2\pi$ f'(x)=cosx-sinx=$\sqrt{2}$(cosx.sin$\frac{\pi}{4}$-sinx cos$\frac{\pi}{4}$)=-$\sqrt{2}\sin\left(x-\frac{\pi}{4}\right)$ 0<x<2 $\pi=>0-\frac{\pi}{4}<x-\frac{\pi}{4}<2\pi-\frac{\pi}{4}$ -$\frac{\pi}{4}<x-\frac{\pi}{4}<\frac{7\pi}{4}$ <u>f(x) is strictly increasing if f'(x)>0</u> $$=>-\sqrt{2}\sin\left(x-\frac{\pi}{4}\right)>0$$ $$=>\sin\left(x-\frac{\pi}{4}\right)<0=>\frac{-\pi}{4}<x-\frac{\pi}{4}<0$$ <u>Or</u> $\pi<x-\frac{\pi}{4}<\frac{7\pi}{4}$ Or 0<x<$\frac{\pi}{4}$ $or5\frac{\pi}{4}$<x<2π ⇨ f(x) is strictly increasing when x∈ $[0,\frac{\pi}{4})\cup(\frac{5\pi}{4},2\pi]$ <u>For strictly decreasing:</u> $$-\sqrt{2}\sin\left(x-\frac{\pi}{4}\right)<0$$ $$\sin\left(x-\frac{\pi}{4}\right)>0$$ =>0< $x-\frac{\pi}{4}<\pi$=>$\frac{\pi}{4}<x<\frac{5\,\pi}{4}$ $x\in(\frac{\pi}{4},\frac{5\pi}{4})$ f(x) is strictly decreasing when $x\in(\frac{\pi}{4},\frac{5\pi}{4})$ <u>OR</u> X=y^2	 $1\frac{1}{2}$ $1\frac{1}{2}$

	1=2y$\frac{dy}{dx}$ $$\frac{dy}{dx}=\frac{1}{2y}$$ xy=k=>x$\frac{dy}{dx}$+y=0=>$\frac{dy}{dx}$=$\frac{-y}{x}$ curve intersect at right angle if $m_1 m_{2=-1}$ =>($\frac{1}{2y}$)($\frac{-y}{x}$) $= -1 =>$ $\frac{1}{2x}$=1=>x=$\frac{1}{2}$ X=$y^2 = \frac{1}{2}$ xy=k=>$x^2y^2 = k^2$ (1/4)(1/2)= k^2 ∴8$k^2 = 1$	1 1 1
34	$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{tanx}}$$ $\mathrm{I} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{cosx}}{\sqrt{cosx}+\sqrt{sinx}}dx$ …………………(i) $$\mathrm{I} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{\cos(\frac{\pi}{2}-x)}}{\sqrt{\cos(\frac{\pi}{2}-x)}+\sqrt{\sin(\frac{\pi}{2}-x)}}dx$$ $\mathrm{I} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{sinx}}{\sqrt{sinx}+\sqrt{cosx}}dx$…………………..(ii) Adding (i) &(ii) we get 2 I=$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{cosx}+\sqrt{sinx}}{\sqrt{cosx}+\sqrt{sinx}}dx$ 2 $\mathrm{I} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} 1.dx$=x$]_{\frac{\pi}{6}}^{\frac{\pi}{3}}$=>2 $\mathrm{I} = \frac{\pi}{3} - \frac{\pi}{6} = \frac{\pi}{6} =>\ \mathrm{I} = \frac{\pi}{12}$	2 1

35	 $\frac{x^2}{16}+\frac{y^2}{9}=1 \quad \Rightarrow \quad y^2 = 9\left(1-\frac{x^2}{16}\right)$ Required Area $= 4\int_0^4 3\sqrt{1-\frac{x^2}{16}}\,dx$ $= 3\int_0^4 \sqrt{16-x^2}\,dx = 3\left[\frac{x}{2}\sqrt{16-x^2}+8\sin^{-1}\frac{x}{4}\right]_0^4$ $= 3\left[8\times\frac{\pi}{2}-0\right] = 12\pi$ sq. units	1 1 1
36	Let A= $\begin{bmatrix}1 & -1 & 2\\ 0 & 2 & -3\\ 3 & -2 & 4\end{bmatrix}\begin{bmatrix}-2 & 0 & 1\\ 9 & 2 & -3\\ 6 & 1 & -2\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$ =>|A|= -1 $\quad A^{-1}=\frac{1}{\|A\|}Adj\ A$ $\begin{bmatrix}x\\ y\\ z\end{bmatrix}=A^{-1}B=\begin{bmatrix}-2 & 0 & 1\\ 9 & 2 & -3\\ 6 & 1 & -2\end{bmatrix}\begin{bmatrix}1\\ 1\\ 2\end{bmatrix}=\begin{bmatrix}0\\ 5\\ 3\end{bmatrix}$ x=0,y=5,z=3 OR Let A= $\begin{bmatrix}1 & -1 & 2\\ 3 & 4 & -5\\ 2 & -1 & 3\end{bmatrix}$, B= $\begin{bmatrix}7\\ -5\\ 12\end{bmatrix}$, X= $\begin{bmatrix}x\\ y\\ z\end{bmatrix}$	2 ½ 2 ½

	adjA= $\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}$ $\lvert A\rvert = 4$, $A^{-1} = \frac{1}{\lvert A\rvert} Adj\ A$ X= $A^{-1}B = \frac{1}{4}\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}\begin{bmatrix} 7 \\ -5 \\ 12 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$ x=2, y=1,z=3	2 ½+½ 1½ ½
37	Equation of plane through given 3 points $\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_3-y_1 & z_3-z_1 \end{vmatrix}=0$ => $\begin{vmatrix} x-2 & y-5 & z+3 \\ -4 & -8 & 8 \\ 3 & -2 & 0 \end{vmatrix}=0$ =>2x+3y+4z=7 Distance= $\frac{\lvert ax_1+by_1+cz_1+d\rvert}{\sqrt{a^2+b^2+c^2}} = \frac{2X7+3X2+4X4-7}{\sqrt{4+9+16}} = \frac{29}{\sqrt{29}} = \sqrt{29}$ OR Solving the equation of line and plane, we get (2+3λ).1-(-1+4λ)+(-2+2λ)=5 =>λ = 4 Therefore point of intersection of line and plane is (14,15,6) Thus Distance between the point (–1, –5, –10) and (14,15,6) is $\sqrt{225+400+256} = \sqrt{881}$	2 1 2 $2\frac{1}{2}$ 1 $1\frac{1}{2}$

38	 Let x is the number of dolls of type A and y is the number of dolls of type B that are manufactured. Now according to question Maximize Z = 12x + 16y subject to costraints x + y <= 1200 ....1 y <= x/2 => 2y <= x => x - 2y >= 0 ....2 x <= 3y + 600 => x - 3y <= 600 ......3 x >= 0, y >= 0 ....4 Now draw the graph using equation 1 to 4 as shown in figure. The shaded portion in the graph depicts the feasible region. Point Z = 12x + 16y A(800, 400) 7200 B(1050, 150) 15000 C(600, 0) 16000 The maximum profit is 16000. OR	2 3



Sol. From the figure we have bounded region with corner points as
$P\left(\frac{3}{13},\frac{24}{13}\right), Q\left(\frac{3}{2},\frac{15}{4}\right), R\left(\frac{7}{2},\frac{3}{4}\right), S\left(\frac{18}{7},\frac{2}{7}\right)Q.$

Also $Z = x + 2y$.

Corner points	Corresponding value of Z
$\left(\frac{3}{13},\frac{24}{13}\right)$	$\frac{51}{13}=3\frac{12}{13}$
$\left(\frac{18}{7},\frac{2}{7}\right)$	$\frac{22}{7}=3\frac{1}{7}$ **(Minimum)**
$\left(\frac{7}{2},\frac{3}{4}\right)$	$\frac{20}{4}=5$
$\left(\frac{3}{2},\frac{15}{4}\right)$	$\frac{36}{4}=9$ **(Maximum)**

Hence, the maximum and minimum value of Z are 9 and $3\frac{1}{7}$, respectively

3

(ii) Z=px+qy

$Z=\frac{3p}{2}+\frac{15q}{4}$ at $(\frac{3}{2},\frac{15}{4})$

$Z=\frac{7p}{2}+\frac{3q}{4}$ at $(\frac{7}{2},\frac{3}{4})$

Both values of Z are maximum$\therefore$ $\frac{3p}{2}+\frac{15q}{4}=\frac{7p}{2}+\frac{3q}{4}$

$-\frac{4p}{2}=-\frac{12q}{4}$=>2p=3q

No of maximum solutions are infinite lying in the line joining Q and R.

2