QUESTION PAPER CODE 65(B)
EXPECTED ANSWER/VALUE POINTS
SECTION A

1. $|A| = |3B| = 3^3 \times |B| = 27 \times 2 = 54$ $\quad \frac{1}{2}+\frac{1}{2}$

2. Put $\sin^{-1} x = t \Rightarrow \frac{1}{\sqrt{1-x^2}} dx = dt$ $\quad \frac{1}{2}$

$\therefore \quad I = \int t\, dt = \frac{t^2}{2} + c = \frac{1}{2}(\sin^{-1} x)^2 + c$ $\quad \frac{1}{2}$

3. $u = \tan x \Rightarrow \frac{du}{dx} = \sec^2 x$

$v = \sec x \Rightarrow \frac{dv}{dx} = \sec x \tan x$ (any one correct) $\quad \frac{1}{2}$

$\therefore \quad \frac{du}{dv} = \frac{\sec^2 x}{\sec x \cdot \tan x}$ or cosec x $\quad \frac{1}{2}$

4. $|\hat{a} - \hat{b}| = 1 \Rightarrow |\hat{a} - \hat{b}|^2 = 1 \Rightarrow |\hat{a}|^2 + |\hat{b}|^2 - 2|\hat{a}||\hat{b}|\cos\theta = 1$ $\quad \frac{1}{2}$

$\Rightarrow \quad \cos\theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{3}$ $\quad \frac{1}{2}$

SECTION B

5. Put $\cot^{-1}(-x) = \theta \Rightarrow x = -\cot\theta = \cot(\pi - \theta)$ $\quad 1$

$\Rightarrow \quad \pi - \theta = \cot^{-1} x$

$\Rightarrow \quad \theta = \pi - \cot^{-1} x$

$\Rightarrow \quad \cot^{-1}(-x) = \pi - \cot^{-1} x$ $\quad 1$

6. $\sin^{-1}\frac{2}{7}+\cos^{-1}2x = \sin^{-1}1=\frac{\pi}{2}$ 1

$\Rightarrow \quad \frac{2}{7} = 2x \quad \Rightarrow \quad x=\frac{1}{7}$ 1

7. $2X=\begin{pmatrix}7 & 4\\ -1 & 10\end{pmatrix}-3\begin{pmatrix}3 & 2\\ 1 & 4\end{pmatrix}=\begin{pmatrix}-2 & -2\\ -4 & -2\end{pmatrix}$ $1\frac{1}{2}$

$\therefore \quad X=\begin{pmatrix}-1 & -1\\ -2 & -1\end{pmatrix}$ $\frac{1}{2}$

8. f being polynomial is continuous in [1, 3] and differentiable in (1, 3) with $f'(x)=3x^2-10x-3$ $\frac{1}{2}$

$\therefore \quad f'(c)=\frac{f(3)-f(1)}{3-1} \Rightarrow 3c^2-10c-3=-10$

$\Rightarrow \quad 3c^2-10c+7=0$ 1

$\Rightarrow \quad c=1, \frac{7}{3}$

Since $1 \notin (1, 3), \frac{7}{3} \in (1, 3)$ $\frac{1}{2}$

$\therefore$ Theorem verified.

9. $6y=x^3+2 \Rightarrow 6\frac{dy}{dt} = 3x^2 \cdot \frac{dx}{dt}$ ...(1) $\frac{1}{2}$

Given: $\frac{dy}{dt} = 2\cdot\frac{dx}{dt}$ ...(2) $\frac{1}{2}$

from (1) and (2), $2\left(2\frac{dx}{dt}\right) = x^2 \cdot \frac{dx}{dt} \quad \Rightarrow \quad x=\pm 2$

when $x=2,\ y=\frac{5}{3}$; when $x=-2,\ y=-1$

$\therefore$ Points are $\left(2, \frac{5}{3}\right)$ and $(-2, -1)$ 1

10. $I = \int \frac{\sin(x+a-2a)}{\sin(x+a)}dx$ $\frac{1}{2}$

$$= \int \frac{\sin(x+a)\cos 2a - \cos(x+a)\cdot\sin 2a}{\sin(x+a)}dx$$

$= x\cos 2a - \sin 2a \cdot \log|\sin(x+a)| + c$ $1\frac{1}{2}$

11. Diagonals of parallelogram are $\vec{a}+\vec{b}$ and $\vec{b}-\vec{a}$ [or $\vec{a}-\vec{b}$]

$\vec{a}+\vec{b} = 3\hat{i}-8\hat{j}+4\hat{k}$ and $\vec{b}-\vec{a} = \hat{i}-6\hat{j}-2\hat{k}$ 1

$$\text{Req. area} = \frac{1}{2}\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -8 & 4 \\ 1 & -6 & -2 \end{vmatrix} = \frac{1}{2}|40\hat{i}+10\hat{j}-10\hat{k}|$$

$= \frac{1}{2}\sqrt{1800} = 15\sqrt{2}$ sq. units 1

12. P (getting an odd no. atleast once)

= 1 – P(even no. & even no. & even no.) 1

$= 1 - \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2} = \frac{7}{8}$ 1

SECTION C

13. $R_1 \to x\cdot R_1, R_2 \to y\cdot R_2, R_3 \to z\cdot R_3$

$$\text{LHS} = \frac{1}{xyz}\begin{vmatrix} x^2y & x^2z & x(x^2+1) \\ y(y^2+1) & y^2z & xy^2 \\ yz^2 & z(z^2+1) & xz^2 \end{vmatrix}$$ 1

taking y, z and x respectively common from C_1, C_2, C_3

$$= \frac{xyz}{xyz}\begin{vmatrix} x^2 & x^2 & x^2+1 \\ y^2+1 & y^2 & y^2 \\ z^2 & z^2+1 & z^2 \end{vmatrix}$$ 1

$R_1 \to R_1 + R_2 + R_3$

$$= \begin{vmatrix} 1+x^2+y^2+z^2 & 1+x^2+y^2+z^2 & 1+x^2+y^2+z^2 \\ y^2+1 & y^2 & y^2 \\ z^2 & z^2+1 & z^2 \end{vmatrix}$$

$$= (1+x^2+y^2+z^2)\begin{vmatrix} 1 & 1 & 1 \\ y^2+1 & y^2 & y^2 \\ z^2 & z^2+1 & z^2 \end{vmatrix}$$ 1

$C_1 \to C_1 - C_3,\ C_2 \to C_2 - C_3$

$$= (1+x^2+y^2+z^2)\begin{vmatrix} 0 & 0 & 1 \\ 1 & 0 & y^2 \\ 0 & 1 & z^2 \end{vmatrix} = 1+x^2+y^2+z^2$$ 1

$= \text{RHS}$

OR

$\text{LHS} = A^2 - 7A + 10I_3$

$$= \begin{pmatrix} 11 & 14 & 0 \\ 7 & 18 & 0 \\ 0 & 0 & 25 \end{pmatrix} - \begin{pmatrix} 21 & 14 & 0 \\ 7 & 28 & 0 \\ 0 & 0 & 35 \end{pmatrix} + \begin{pmatrix} 10 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 10 \end{pmatrix}$$ $1\frac{1}{2}+1$

$$= \begin{matrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{matrix} = O$$ $\frac{1}{2}$

Now, $A^2 - 7A + 10I = O$

$\Rightarrow \quad A^{-1}(A^2 - 7A + 10I) = A^{-1}.\,O \Rightarrow A^{-1} = \frac{1}{10}(7I - A)$ $\frac{1}{2}$

$$= \frac{1}{10}\begin{pmatrix} 4 & -2 & 0 \\ -1 & 3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$ $\frac{1}{2}$

14. $k = \lim_{x\to0} \frac{(3^{\sin x}-1)^2}{x \log(1+5x)}$

$= \lim_{x\to0} \frac{(3^{\sin x}-1)^2}{\sin^2 x} \times \lim_{x\to0} \frac{\sin^2 x}{x^2} \times \frac{1}{5} \lim_{x\to0} \frac{1}{\frac{\log(1+5x)}{5x}}$ 1+1+1

$= \frac{1}{5}(\log 3)^2$ 1

OR

Getting

$\frac{dy}{dx} = \frac{-1}{\sqrt{1-x}\,(1+x)^{3/2}}$ 2

$\therefore \quad \text{LHS} = (1-x^2)\cdot\left(\frac{-1}{\sqrt{1-x}\,(1+x)^{3/2}}\right) + \sqrt{\frac{1-x}{1+x}}$ 1

$= -\sqrt{\frac{1-x}{1+x}} + \sqrt{\frac{1-x}{1+x}} = 0 = \text{R.H.S.}$ 1

15. $y\cdot\log(\sin x) = \log(x+y)$

$\Rightarrow y\cdot\frac{\cos x}{\sin x} + \log(\sin x)\cdot\frac{dy}{dx} = \frac{1}{x+y}\left(1+\frac{dy}{dx}\right)$ 2

$\Rightarrow \left(y\cot x - \frac{1}{x+y}\right) = \left(\frac{1}{x+y} - \log(\sin x)\right)\cdot\frac{dy}{dx}$ 1

$\Rightarrow [(x+y)\cdot y\cot x - 1] = [1-(x+y)\log(\sin x)]\cdot\frac{dy}{dx}$

$\Rightarrow \frac{dy}{dx} = \frac{1-(x+y)\cdot y\cot x}{(x+y)\log(\sin x)-1}$ 1

16. Let $\frac{x^2+x}{(x-1)(x^2+1)} = \frac{A}{x-1} + \frac{Bx+C}{x^2+1}$ 1

Getting $A = 1, B = 0, C = 1$ 1

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

$$= \log|x-1| + \tan^{-1}x + C$$ 1+1

OR

$$I = \int \cos(3x+1)\cdot e^{2x}dx$$

$$= \cos(3x+1)\cdot\frac{e^{2x}}{2} - \int -3\sin(3x+1)\cdot\frac{e^{2x}}{2}dx$$ 1

$$= \frac{1}{2}\cdot e^{2x}\cos(3x+1) + \frac{3}{2}\int \sin(3x+1)\cdot e^{2x}dx$$

$$= \frac{1}{2}e^{2x}\cos(3x+1) + \frac{3}{2}\left[\sin(3x+1)\cdot\frac{e^{2x}}{2} - \int 3\cos(3x+1)\cdot\frac{e^{2x}}{2}dx\right]$$ 1

$$= \frac{1}{2}e^{2x}\cos(3x+1) + \frac{3}{4}\sin(3x+1)\cdot e^{2x} - \frac{9}{4}I$$ 1

$$\Rightarrow I = \frac{e^{2x}}{13}[2\cos(3x+1) + 3\sin(3x+1)] + C$$ 1

17. $$I = \int_0^{\pi/2} \frac{\sin^2 x}{\sin x + \cos x}dx = \int_0^{\pi/2} \frac{\sin^2(\pi/2 - x)}{\sin(\pi/2 - x) + \cos(\pi/2 - x)}dx$$ 1

$$I = \int_0^{\pi/2} \frac{\cos^2 x}{\cos x + \sin x}dx$$

$$\therefore 2I = \int_0^{\pi/2} \frac{1}{\sin x + \cos x}dx$$ $\frac{1}{2}$

$$2I = \frac{1}{\sqrt{2}}\int_0^{\pi/2} \frac{1}{\frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x}dx = \frac{1}{\sqrt{2}}\int_0^{\pi/2} \mathrm{cosec}(\pi/4 + x)dx$$ 1

$I = \frac{1}{2\sqrt{2}} \log | \operatorname{cosec}(\pi/4 + x) - \cot(\pi/4 + x) |]_0^{\pi/2}$ 1

$= \frac{1}{2\sqrt{2}}\left\{\log(\sqrt{2}+1) - \log(\sqrt{2}-1)\right\}$ $\frac{1}{2}$

18. I.F. $= e^{\int -3\cot x\, dx} = e^{-3\log(\sin x)} = \operatorname{cosec}^3 x$ 1

solution is given by:

$y \cdot \operatorname{cosec}^3 x = \int \sin 2x \cdot \operatorname{cosec}^3 x\, dx + c$ 1

$= 2\int \cot x \cdot \operatorname{cosec} x\, dx + c$

$= -2 \operatorname{cosec} x + c$ 1

$\therefore\ y = -2\sin^2 x + c\sin^3 x$

when $y = 2,\ x = \frac{\pi}{2} \Rightarrow c = 4$ $\frac{1}{2}$

$\therefore\ y = = -2\sin^2 x + 4\sin^3 x$ $\frac{1}{2}$

19. Equation of ellipse is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1;\ a > b$ 1

$\Rightarrow \frac{2x}{a^2} + \frac{2y \cdot y'}{b^2} = 0$

$\Rightarrow \frac{yy'}{x} = -\frac{b^2}{a^2}$ 1

differentiating again,

$\Rightarrow \frac{x[y \cdot y'' + y' \cdot y'] - yy' \cdot 1}{x^2} = 0$ 1

$\Rightarrow xy \cdot y'' + x(y')^2 - yy' = 0$

or $xy\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 - y\left(\frac{dy}{dx}\right) = 0$ 1

20. For coplanarity $[\overrightarrow{AB} \quad \overrightarrow{AC} \quad \overrightarrow{AD}] = 0$ 1

$\overrightarrow{AB} = [\hat{i} + (x-2)\hat{j} + 4\hat{k}]$

$\overrightarrow{AC} = \hat{i} - 3\hat{k}$ $1\frac{1}{2}$

$\overrightarrow{AD} = 3\hat{i} + 3\hat{j} - 2\hat{k}$

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

$\Rightarrow x = 5$ $\frac{1}{2}$

21. Here, $\vec{a}_2 - \vec{a}_1 = 3\hat{i} + 3\hat{j} + 3\hat{k}$ $\frac{1}{2}$

$\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -3 & 2 \\ 2 & 3 & 1 \end{vmatrix} = -9\hat{i} + 3\hat{j} + 9\hat{k}$ 1

$|\vec{b}_1 \times \vec{b}_2| = \sqrt{81+9+81} = \sqrt{171}$ $\frac{1}{2}$

S.D. $= \left| \frac{(\vec{a}_2 - \vec{a}_1)\cdot(\vec{b}_1 \times \vec{b}_2)}{|\vec{b}_1 \times \vec{b}_2|} \right|$ $\frac{1}{2}$

$= \frac{3(-9)+3(3)+3(9)}{\sqrt{171}} = \frac{3}{\sqrt{19}}$ units $1\frac{1}{2}$

22. E_1: Bag A is selected; E_2: Bag B is selected

E_3: Bag C is selected; A: Getting the Red ball $\frac{1}{2}$

$P(E_1) = P(E_2) = P(E_3) = 1/3$ $\frac{1}{2}$

$P(A/E_1) = 1/2$, $P(A/E_2) = 3/8$, $P(A/E_3) = 5/8$ 1

Using Bayes' theorem, $P(E_2/A) = \dfrac{P(E_2)\cdot P(A/E_2)}{P(E_1)\cdot P(A/E_1) + P(E_2)\cdot P(A/E_2) + P(E_3)\cdot P(A/E_3)}$

$$= \frac{\frac{1}{3}\times\frac{3}{8}}{\frac{1}{3}\times\frac{4}{8}+\frac{1}{3}\times\frac{3}{8}+\frac{1}{3}\times\frac{5}{8}}$$ $1\frac{1}{2}$

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

23. Let X represent the no. of kings

$\therefore$ X = 0, 1, 2 $\frac{1}{2}$

$$P(X=0) = \frac{48}{52}\times\frac{47}{51} = \frac{564}{663}$$

$$P(X=1) = 2\times\frac{4}{52}\times\frac{48}{51} = \frac{96}{663}$$ 2

$$P(X=2) = \frac{4}{52}\times\frac{3}{51} = \frac{3}{663}.$$

Probability distribution table is:

X	0	1	2
P(X)	$\frac{564}{663}$	$\frac{96}{663}$	$\frac{3}{663}$

$\frac{1}{2}$

Mean $= \sum X\cdot P(X) = 1\times\frac{96}{663} + 2\times\frac{3}{663} = \frac{2}{13}$ 1

SECTION D

24. Let $x_1, x_2 \in [-1, 1]$

Let $f(x_1) = f(x_2)$

$$\Rightarrow \frac{x_1}{x_1+2} = \frac{x_2}{x_2+2} \Rightarrow x_1x_2 + 2x_1 = x_1x_2 + 2x_2$$

$\Rightarrow x_1 = x_2 \Rightarrow$ f is 1 – 1 function 2

For, f: $[-1, 1] \to R_f$

Given, co-domain = Range $\Rightarrow$ f is onto 1

$\Rightarrow$ f is invertible

To find f^{-1}: Let $y = f(x) \Rightarrow x = f^{-1}(y)$

Now, $y = \dfrac{x}{x+2} \quad \Rightarrow \quad x = \dfrac{2y}{1-y};\ y \neq 1$

$\therefore \quad f^{-1}(x) = \dfrac{2x}{1-x};\ x \neq 1$ 1

getting $f^{-1}\left(\dfrac{-1}{3}\right) = \dfrac{-1}{2}$ 1

$f^{-1}\left(\dfrac{1}{5}\right) = \dfrac{1}{2}$ 1

OR

$b * a = \dfrac{b+a}{2} = \dfrac{a+b}{2} = a * b \ \ \forall\ a, b \in R$

$\therefore$ * is commutative. 2

Let $a, b, c \in R$

Consider $(a * b) * c = \left(\dfrac{a+b}{2}\right) * c = \dfrac{a+b+2c}{2}$

and, $a * (b * c) = a * \left(\dfrac{b+c}{2}\right) = \dfrac{2a+b+c}{2}$

clearly, $(a * b) * c \neq a * (b * c)$

$\Rightarrow$ * is not associative. [Can be shown by example] 2

Let $e \in R$ be identity (if exists)

then, $a * e = a = e * a$

$$\Rightarrow \frac{a+e}{2} = a = \frac{e+a}{2} \quad \Rightarrow \quad a + e = 2a$$

$\Rightarrow e = a$, which is not unique 2

$\therefore$ e does not exist.

25. Given system can be written as

$$\begin{bmatrix} 1 & -1 & 2 \\ 3 & 4 & -5 \\ 2 & -1 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ -5 \\ 12 \end{bmatrix}$$ 1

i.e, AX = B

$|A| = 4 \neq 0 \Rightarrow A^{-1}$ exists.

Now, $A_{11} = 7, \quad A_{12} = -19, \quad A_{13} = -11$

$A_{21} = 1, \quad A_{22} = -1, \quad A_{23} = -1$ 2

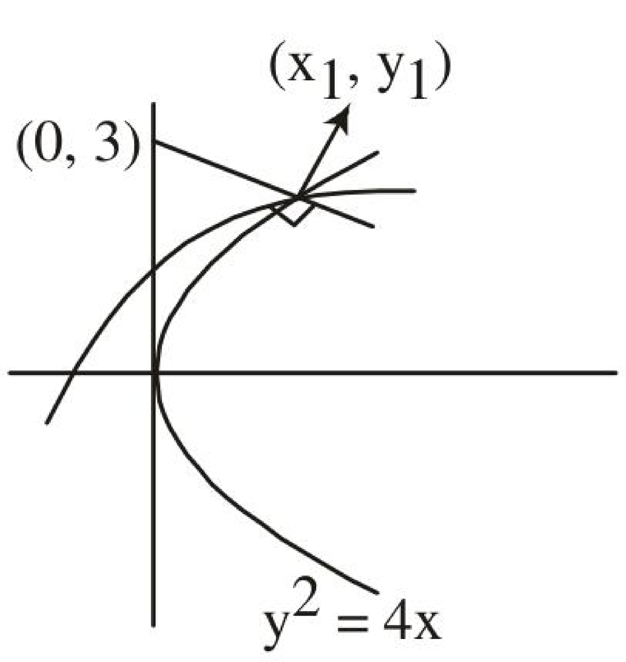
$A_{31} = -3, \quad A_{32} = 11, \quad A_{33} = 7$

$$\therefore A^{-1} = \frac{1}{4}\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}$$ 1

$$\therefore \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{4}\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}\begin{bmatrix} 7 \\ -5 \\ 12 \end{bmatrix}$$ $\frac{1}{2}$

$$= \frac{1}{4}\begin{bmatrix} 8 \\ 4 \\ 12 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix} \quad \Rightarrow \quad x = 2, y = 1, z = 3$$ $1\frac{1}{2}$

26.



$$y^2 = 4x \Rightarrow 2y\frac{dy}{dx} = 4 \quad \Rightarrow \quad \frac{dy}{dx} = \frac{2}{y}$$ $\frac{1}{2}$

$$\therefore \left.\frac{dy}{dx}\right]_{(x_1, y_1)} = \frac{2}{y_1}$$

$\Rightarrow$ slope of normal $= -\frac{y_1}{2}$ $\frac{1}{2}$

Equation of normal: $y - y_1 = -\frac{y_1}{2}(x - x_1)$ 1

Normal passes through (0, 3)

$\therefore\ 3 - y_1 = -\frac{y_1}{2}(0 - x_1) \Rightarrow 6 - 2y_1 = x_1 y_1 \quad ...(1)$ $\frac{1}{2}$

also, (x_1, y_1) lies on $y^2 = 4x \Rightarrow {y_1}^2 = 4x_1 \quad ...(2)$

Solving (1) and (2), $x_1 = 1, y_1 = 2 \therefore (x_1, y_1) = (1, 2)$ $1\frac{1}{2}$

Slope of normal $= \frac{-y_1}{2} = \frac{-2}{2} = -1$

Equation of normal is $y - 2 = -(x - 1) \Rightarrow x + y = 3$ 2

OR

Let perimeter of square be x cm, then circumference of circle is (28 – x) cm.

Let side of square is a and radius of circle is r, then, $a = \frac{x}{4}, r = \frac{28 - x}{2\pi}$ 1

Now, $A = \left(\frac{x}{4}\right)^2 + \pi\left(\frac{28 - x}{2\pi}\right)^2$ 1

$\therefore\ A = \frac{x^2}{16} + \frac{1}{4\pi}(28 - x)^2$

$\Rightarrow \frac{dA}{dx} = \frac{x}{8} - \frac{1}{2\pi}(28 - x)$ 1

$\frac{dA}{dx} = 0 \Rightarrow x = \frac{112}{\pi + 4}$ cm 1

$\frac{d^2A}{dx^2} = \frac{1}{8} + \frac{1}{2\pi} > 0 \Rightarrow$ Area is minimum 1

other length $= 28 - x = 28 - \frac{112}{\pi + 4}$ cm $= \frac{28\pi}{\pi + 4}$ cm 1

27. $A = \int_2^4 3\sqrt{x}\,dx = 3\times\frac{2}{3}[x^{3/2}]_2^4$ 2+2

$= 2\,(8 - 2^{3/2})$ sq. units 2

OR

a = 2, b = 5, nh = 3 1

Let $f(x) = 2x^2 + 3x + 1$

$\int_2^5 (2x^2 + 3x + 1)dx = \lim_{h\to 0} h\cdot[f(2) + f(2+h) + f(2+2h) + \ldots + f(2+(n-1)h)]$ 1

here, $f(2) = 2(2)^2 + 3(2) + 1 = 15$

$f(2 + h) = 2(2 + h)^2 + 3(2 + h) + 1 = 2h^2 + 11h + 15$

$f(2 + 2h) = 2[2 + 2h]^2 + 3[2 + 2h] + 1 = 2.2^2h^2 + 22h + 15$

$f(2 + (n-1)h) = 2[2 + (n-1)h]^2 + 3[2 + (n-1)h] + 1$ 1

$= 2(n-1)^2h^2 + 11(n-1)h + 15$

$\therefore \int_2^5 (2x^2 + 3x + 1)dx$

$= \lim_{h\to 0} h\cdot[15 + (2h^2 + 11h + 15) + \ldots + (2(n-1)^2h^2 + 11(n-1)h + 15)]$ 1

$= \lim_{h\to 0} h[15n + 2h^2\cdot(1^2 + 2^2 + \ldots + (n-1)^2) + 11h(1 + 2 + \ldots + (n-1))]$

$= \lim_{h\to 0}\left(15nh + 2\cdot\frac{(nh)(nh-h)(2nh-h)}{6} + \frac{11\cdot(nh)(nh-h)}{2}\right)$ 1

$= \lim_{h\to 0}\left(45 + \frac{1}{3}\times 3(3-h)(6-h) + \frac{11}{2}\times 3(3-h)\right)$

$= 45 + 18 + \frac{99}{2} = \frac{225}{2}$ 1

28. Any point on given line is $(3\lambda + 2)\hat{i} + (4\lambda - 1)\hat{j} + (2\lambda + 2)\hat{k}$ 1

If this line and given plane intersect, then

$1(3\lambda + 2) - 1(4\lambda - 1) + 1(2\lambda + 2) = 5 \Rightarrow \lambda = 0$ 2

$\therefore$ Point of intersection is $(2, -1, 2)$ 1

$\therefore$ the distance $= \sqrt{(2+1)^2 + (-1+5)^2 + (2+10)^2} = 13$ units 2

29. Let x kg of food X and y kg of food Y are mixed then,

minimum cost, $Z = 16x + 20y$ 1

subject to following constraints:

$x + 2y \geq 10$

$2x + 2y \geq 12$ or $x + y \geq 6$ 4

$3x + y \geq 8$

$x \geq 0, y \geq 0$

Value: Any relevant value. 1