केवल मूल्यांकनकर्ता के उपयोग हेतु!

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

32 पृष्ठीय

केवल परीक्षक द्वारा भरा जावे।
प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करे।

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
1		
2		
3		
4		
5		
6		
7		
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प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
16		
17		
18		
19		
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24		
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26		
27		
28		

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे

प्रमाणित किया जाता है कि अन्दर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अर्कों का योग सही है।
निर्धारित मुद्राः नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदांकित संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
P.C.Tyagi (Lect.) Govt.G.H.S.S.Ba... V.N.782758	LOKESH RAHA... H.S.S.-BHARVELI V.No.-78...

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Question - 01

(i) Ans → (c) $\theta = \pi$

(ii) Ans → (d) neither one-one nor onto

(iii) Ans → (b) $-\frac{\pi}{6}$

(iv) Ans → (c) 16

(v) Ans → (d) $\frac{1}{36}$

(vi) Ans → (a) 4

Question - 02

(i) Ans → 1 (one)

(ii) Ans → $-e^{-x}$

(iii) Ans → critical point

(iv) Ans → equivalance

(v) Ans → principal value

(vi) Ans → symmetric matrix

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Question

(i) Ans → False

(ii) Ans → False

(iii) Ans → True

(iv) Ans → True

(v) Ans → True

(vi) Ans → False

Question -04

(i) $\int \frac{dx}{a^2 - x^2}$ — $\frac{1}{2a} \log \left| \frac{a+x}{a-x} \right| + C$

(ii) Simple form, $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$ — $\sec^{-1} x$

(iii) $\int \sqrt{x^2 - a^2}\, dx$ — $\frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2} \log \left| x + \sqrt{x^2+a^2} \right| + C$

(iv) $\int \sqrt{a^2 - x^2}\, dx$ — $\frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} + C$

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(v) $\int \frac{dx}{\sqrt{x^2-a^2}} = \log|x+\sqrt{x^2-a^2}| + C$

(vi) $\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\frac{x}{a} + C$

(vii) $\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\log\left|\frac{x-a}{x+a}\right| + C$

B S E

Question -05

(i) Ans → $\pm \frac{1}{\sqrt{3}}$

(ii) Ans → 1

(iii) Ans → one

(iv) Ans → e^{2x}

(v) Ans → zero

(vi) Ans → 0

(vii) Ans → one

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Question – 6

Solve: Given eqn: $2x + 3y = \sin x$

To find: $dy/dx = ?$

Solution:

$$2x + 3y = \sin x$$

$$2\frac{dx}{dx} + 3\frac{dy}{dx} = \cos x$$ D.W.R. to x. both side

$$2 + 3\frac{dy}{dx} = \cos x$$

$$3\frac{dy}{dx} = \cos x - 2$$

Ans: $$\frac{dy}{dx} = \frac{\cos x - 2}{3}$$

Question – 07

Solve Given: $f(x) = 3x + 17$

To show: $f(x)$ is increasing on R

$$f(x) = 3x + 17$$

$$f'(x) = 3\frac{dx}{dx} + 0$$ D.W.R. to x

$$f'(x) = 3$$

as, $f'(x) > 0$ for all $x \in R$
then. $f(x)$ is increasing on R

Question – 08

Solve: Given: $\frac{dr}{dt} = 0.7$ cm/s, $r = 4.9$ cm

To find: $\frac{dC}{dt} = ?$ C is circumference

we know that, $C = 2\pi r$

$$\frac{dC}{dt} = \frac{d(2\pi r)}{dr} \cdot \frac{dr}{dt}$$

$$= 2\pi \cdot (0.7)$$

$$= 1.4\pi$$

Ans: $\frac{dC}{dt} = 1.4\pi \ \frac{cm}{s}$

Question – 09

Solve:- Given: $I = \int x e^x \, dx$

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$$I = \int x e^x dx \quad \left\{ \because \int uv\,dx = u\int v\,dx - \int\left(\frac{d}{dx}u \int v\,dx\right)dx + c \right.$$

by formula,

$$I = x\int e^x dx - \int\left(\frac{d}{dx}x \int e^x dx\right)dx + c$$

$$I = xe^x - \int\left(\frac{dx}{dx}.e^x\right)dx + c$$

$$I = xe^x - \int e^x dx + c$$

$$I = xe^x - e^x + c$$

Ans $$I = e^x(x-1) + c$$

Question – 10 (OR)

Solve: Given: $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$

To find: $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$ $(= \vec{c}) = ?$

$$\vec{a} + \vec{b} = (1+1)\hat{i} + (1+2)\hat{j} + (1+3)\hat{k}$$

$$\vec{a} + \vec{b} = 2\hat{i} + 3\hat{j} + 4\hat{k}$$

Now, $\vec{a} - \vec{b} = (1-1)\hat{i} + (1-2)\hat{j} + (1-3)\hat{k}$

$$= 0\hat{i} - 1\hat{j} - 2\hat{k}$$

$(\vec{a}+\vec{b}) \times (\vec{a}-$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 4 \\ 0 & -1 & -2 \end{vmatrix}$$

$\vec{c} = (-6+4)\hat{i} - (-4-0)\hat{j} + (-2-0)\hat{k}$

Ans. $\vec{c} = -2\hat{i} + 4\hat{j} - 2\hat{k}$

Question - 11

Solve

B

S

E

Given: $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 1\hat{k}$

To find: $\theta = ?$

Solution: we know that,

$$\cos\theta = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}|\,|\vec{b}|}$$

$|\vec{a}| = \sqrt{1^2 + (-2)^2 + 3^2}$

$= \sqrt{1+4+9}$

$|\vec{a}| = \sqrt{14}$

$|\vec{b}| = \sqrt{3^2 + (-2)^2 + 1^2}$

$= \sqrt{9+4+1}$

$|\vec{b}| = \sqrt{14}$

so, $\cos\theta = \dfrac{(\hat{i} - 2\hat{j} + 3\hat{k}) \cdot (3\hat{i} - 2\hat{j} + 1\hat{k})}{\sqrt{14}\cdot\sqrt{14}}$

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$$\cos\theta = \frac{3+4+3}{14}$$

$$\cos\theta = \frac{10}{14}$$

Ans. $$\theta = \cos^{-1}\left(\frac{5}{7}\right)$$

Question – 12 (OR)

Solve:- To show: $l_1: \frac{x+5}{7} = \frac{y+2}{-5} = \frac{z}{-1}$ and $l_2: \frac{x}{-1} = \frac{y-1}{-2} = \frac{z+2}{3}$,

are Lar.

on comparing with, $\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$

here, $a_1 = 7$, $b_1 = -5$, $c_2 = -1$

$a_2 = -1$, $b_2 = -2$, $c_2 = 3$

if they are perpendicular then,

$a_1a_2 + b_1b_2 + c_1c_2$ is equal to 0,

Now, $a_1a_2 + b_1b_2 + c_1c_2 =$

$7(-1) + (-5)(-2) + (-1)(3)$

$a_1a_2 + b_1b_2 + c_1c_2 = -7 + 10 - 3$

$a_1a_2 + b_1b_2 + c_1c_2 = 0$

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it is clear that l_1 is perpendicular to l.

Question – 13 (OR)

Solve: Given: set $A = \{1, 2, 3\}$

$R = \{(1,2)\ (2,1)\ (2,3)\ (3,2)\}$

for reflexive →

as $(1,1) \notin R$

and $(a,a) \notin R \quad \forall\ a \in A$

it is not reflexive

for symmetric →

$(1,2) \in R \Rightarrow (2,1) \in R$

and $(2,3) \in R \Rightarrow (3,2) \in R$

here, if $(a,b) \in R \Rightarrow (b,a) \in R \quad \forall\ a,b \in A$

it is symmetric.

for transitive →

here $(1,2) \in R$, $(2,3) \in R$ but $(1,3) \notin R$

$(a,b) \in R$, $(b,c) \in R$ but $(a,c) \notin R \quad \forall a,b,c \in A$

it is not transitive

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Question – 14 (OR)

Solve: let, $y = \tan^{-1}\left[2\cos\left(2\sin^{-1}\frac{1}{2}\right)\right]$

$y = \tan^{-1}\left[2\cos\left(2\sin^{-1}\sin\frac{\pi}{6}\right)\right]$ $\left\{\because \sin\frac{\pi}{6} = \frac{1}{2}\right\}$

$y = \tan^{-1}\left[2\cos\left(2\cdot\frac{\pi}{6}\right)\right]$

$y = \tan^{-1}\left[2\cos\frac{\pi}{3}\right]$ $\left\{\because \cos\frac{\pi}{3} = \frac{1}{2}\right\}$

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

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

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

Ans. $\boxed{y = \frac{\pi}{4}}$

Question – 15

Solu: To find: x, y, z and t

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given, $2\begin{bmatrix} x & z \\ y & t \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$

$$\begin{bmatrix} 2x & 2z \\ 2y & 2t \end{bmatrix} + \begin{bmatrix} 3 & -3 \\ 0 & 6 \end{bmatrix} = \begin{bmatrix} 9 & 15 \\ 12 & 18 \end{bmatrix}$$

$$\begin{bmatrix} 2x & 2z \\ 2y & 2t \end{bmatrix} = \begin{bmatrix} 9 & 15 \\ 12 & 18 \end{bmatrix} - \begin{bmatrix} 3 & -3 \\ 0 & 6 \end{bmatrix}$$

$$\begin{bmatrix} 2x & 2z \\ 2y & 2t \end{bmatrix} = \begin{bmatrix} 6 & 18 \\ 12 & 12 \end{bmatrix}$$

on comparing,

$2x = 6 \Rightarrow x = 3$

$2z = 18 \Rightarrow z = 9$

$2y = 12 \Rightarrow y = 6$

$2t = 12 \Rightarrow t = 6$

Ans. $x = 3,\ y = 6,\ z = 9,\ t = 6$

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Question - 16

Solve:- let, E_1 : Ball drawn from bag I {Some events}.
E_2 : Ball drawn from bag II
R : Drawn ball is red.

To find that, $P(E_2|R) = ?$

Bag I contain = 3 red and 4 black balls
Bag II contain = 5 red and 6 black balls

Now,

$P(R|E_1) = \frac{3}{7}$, $P(E_1) = \frac{1}{2}$

$P(R|E_2) = \frac{5}{11}$ $P(E_2) = \frac{1}{2}$

$$P(E_2|R) = \frac{P(E_2)\,P(R|E_2)}{P(E_2)\,P(R|E_2) + P(E_1)\,P(R|E_1)}$$

, By bayes' theorem

$$= \frac{1/2 \times 5/11}{\frac{1}{2}\times\frac{5}{11} + \frac{1}{2}\times\frac{3}{7}}$$

$$= \frac{5/22}{\frac{5}{22} + \frac{3}{14}} \rightarrow \frac{5}{22} \div \left(\frac{70+66}{22\times 14}\right)$$

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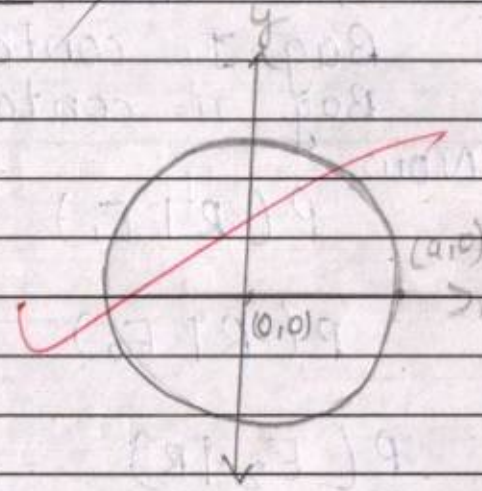
$$= \frac{5}{22} \times \frac{22 \times 147}{136\ 68}$$

Ans. $= \frac{35}{68}$

Question – 17

Solve:- Given eqn: $x^2 + y^2 = a^2$



$$\text{Area} = 4 \int y\, dx$$

$$y^2 = a^2 - x^2$$

$$y = \sqrt{a^2 - x^2}$$

$$\text{Area} = 4 \int_0^a \sqrt{a^2 - x^2}\, dx$$

$$\text{Area} = 4 \left[\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1}\frac{x}{a} \right]_0^a$$

$$\text{Area} = 4 \left[\frac{a}{2}\sqrt{a^2 - a^2} + \frac{a^2}{2} \sin^{-1}\frac{a}{a} - \frac{0}{2}\sqrt{a^2 - 0^2} - \frac{a^2}{2}\sin^{-1} 0 \right]$$

$$\text{Area} = 4 \left[\frac{a}{2}(0) + \frac{a^2}{2}\sin^{-1}(1) - 0 - \frac{a^2}{2}\sin^{-1}\sin 0 \right]$$

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$$\text{Area} = 4\left[\frac{a^2}{2}\sin^{-1}\sin\frac{\pi}{2} - 0\right]$$

$$\text{Area} = 4\times\left[\frac{a^2}{2}\times\frac{\pi}{2}\right]$$

Ans Area $= \pi a^2$ sq. unit

Question – 18 (OR)

B

Solve:- Given eqⁿ : $\frac{dy}{dx} + \frac{y}{x} = x^2$

S

E on compare, with $\frac{dy}{dx} + Py = Q$

$$P = \frac{1}{x}, \quad Q = x^2$$

$$\text{I.F} = e^{\int P dx} \Rightarrow e^{\int \frac{1}{x} dx}$$

$$= e^{\log x} \Rightarrow x \qquad \{\because e^{\log a} = a\}$$

$$\text{I.F.} = x$$

By eqⁿ.

$$y \times \text{I.F.} = \int (Q \times \text{I.F.})\, dx + C$$

$$y \times x = \int (x^2 \times x)\, dx + C$$

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$$yx = \int x^3 dx + C$$

$$yx = \frac{x^4}{4} + C$$

$$y = \frac{x^4}{4x} + \frac{C}{x}$$

$$\boxed{y = \frac{x^3}{4} + Cx^{-1}}$$

or

$$\boxed{4yx = x^4 + c}$$

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Question – 20 (OR)

Solve:- Given:- $f(x) = \begin{cases} ax+1 & \text{if } x \leq 3 \\ bx+3 & \text{if } x > 3 \end{cases}$

is continous, at $x = 3$

at $x = 3$,

$$f(3) = 3a + 1 \quad \text{——— (1) eq.}$$

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$$LHL = \lim_{x \to (3-h)} f(x)$$

$$= \lim_{h \to 0} a(3-h) + 1$$

$$LHL = 3a - ah + 1 \Rightarrow 3a + 1 \quad \text{—— (2)}$$

$$RHL = \lim_{x \to (3+h)} f(x)$$

$$RHL = \lim_{h \to 0} b(3+h) + 3$$

$$RHL = 3b + 3 \quad \text{—— (3)}$$

As, $f(x)$ is con. at $x = 3$

So,

$$f(3) = RHL = LHL$$

$$3a + 1 = 3b + 3 \qquad \text{by (1), (2), (3)}$$

$$3a = 3b + 3 - 1$$

$$3a = 3b + 2$$

$$a = \frac{b+2}{3}$$

Ans. $\boxed{a = b + \frac{2}{3}}$

Question – 21 (OR)

Solve:- let, $I = \int x \tan^{-1} x \, dx$

$I = \int x \tan^{-1} x \, dx$ $\quad \left\{\int uv\,dx = u\int v\,dx - \int\left(\frac{d}{dx}u \int v\,dx\right)dx\right\}$

$I = \int \tan^{-1} x \; x \, dx$

$I = \tan^{-1} x \int x\,dx - \int\left(\frac{d}{dx}\tan^{-1}x \int x\,dx\right)dx$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \int\left(\frac{1}{1+x^2} \cdot \frac{x^2}{2}\right)dx$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\int \frac{x^2}{1+x^2}\,dx$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\int \frac{1+x^2-1}{1+x^2}\,dx$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\int\left(\frac{1+x^2}{1+x^2} - \frac{1}{1+x^2}\right)dx$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\left[\int dx - \int \frac{dx}{1+x^2}\right]$

$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\left[x - \tan^{-1} x\right] + c$

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$$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{1}{2}\left[x - \tan^{-1} x\right] + C$$

Ans $$I = \tan^{-1} x \left[\frac{x^2}{2}\right] - \frac{x}{2} + \frac{1}{2}\tan^{-1} x + C$$

Question – 22 (OR)

Solu:-

Given : $l_1 = \frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$

$l_2 = \frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$

l_1 is perpendicular l_2

To find : $p = ?$

$$l_1 = \frac{x-1}{-3} = \frac{y-2}{\frac{2}{7}p} = \frac{z-3}{2}$$

$$l_2 = \frac{x-1}{-\frac{3}{7}p} = \frac{y-5}{1} = \frac{-(6-z)}{5}$$

$a_1 = -3$, $a_2 = -\frac{3}{7}p$, $b_1 = \frac{2}{7}p$, $b_2 = 1$, $c_1 = 2$, $c_2 = -5$

here, $a_1a_2 + b_1b_2 + c_1c_2 = 0$

$$-3\left(\frac{-3p}{7}\right) + \left(\frac{2p}{7} \times 1\right) + 2(5) = 0$$

$$\frac{9p}{7} + \frac{2p}{7} + (-10) = 0$$

$$\frac{11p}{7} = 10$$

$$p = \frac{10 \times 7}{11}$$

Answer: $\boxed{p = \frac{70}{11}}$

Question – 2.3

Solve:- Given: $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$

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

To show: $(AB)^{-1} = B^{-1}A^{-1}$

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

$$= \begin{bmatrix} 2-3 & -4+9 \\ 1+4 & -2-12 \end{bmatrix}$$

$$AB = \begin{bmatrix} -1 & 5 \\ 5 & -14 \end{bmatrix}$$

B S E

Now,

$|AB| = 14 - 25 \Rightarrow -11$

$(AB)^{-1}$ exist,

$$\text{adj}(AB) = \begin{bmatrix} -14 & -5 \\ -5 & -1 \end{bmatrix}$$

$$(AB)^{-1} = \frac{\text{adj}(AB)}{|AB|}$$

$$= \frac{-1}{11} \begin{bmatrix} -14 & -5 \\ -5 & -1 \end{bmatrix}$$

$$(AB)^{-1} = \frac{1}{11} \begin{bmatrix} 14 & 5 \\ 5 & 1 \end{bmatrix} \quad \text{---- (1) eq.}$$

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Now, $B^{-1} = \frac{adj\ B}{|B|}$, $|B| = \begin{vmatrix} 1 & -2 \\ -1 & 3 \end{vmatrix}$

$|B| = 3 - (2)$

$|B| = 1$

B^{-1} exists,

$adj\ B = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$

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

$A^{-1} = \frac{adj\ A}{|A|}$

$|A| = \begin{vmatrix} 2 & 3 \\ 1 & -4 \end{vmatrix}$

$= -8 - 3$

$|A| = -11$

A^{-1} exists.

$A^{-1} = \frac{-1}{11} [adj\ A]$

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$$\text{adj}(A) = \begin{bmatrix} -4 & -3 \\ -1 & 2 \end{bmatrix}$$

$$A^{-1} = \frac{-1}{11}\begin{bmatrix} -4 & -3 \\ -1 & 2 \end{bmatrix}$$

$$A^{-1} = \frac{1}{11}\begin{bmatrix} 4 & 3 \\ 1 & -2 \end{bmatrix}$$

$$B^{-1}A^{-1} = \frac{1}{11}\begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 4 & 3 \\ 1 & -2 \end{bmatrix}$$

$$= \frac{1}{11}\begin{bmatrix} 12+2 & 9-4 \\ 4+1 & 3-2 \end{bmatrix}$$

$$B^{-1}A^{-1} = \frac{1}{11}\begin{bmatrix} 14 & 5 \\ 5 & 1 \end{bmatrix} \quad \text{---- (2) eq.}$$

y (1) & (2) eq.

$$(AB)^{-1} = B^{-1}A^{-1}$$

Hence, proved

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Question - 19

Solve:- Given cons.: $x + y \leq 50$ —— (1)

$3x + y \leq 90$ —— (2)

$x \geq 0$

$y \geq 0$

To maximise: $Z = 4x + y$

$x + y = 50$

x	0	50
y	50	0

put (0, 0) in

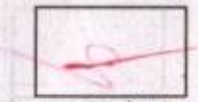
$x + y \leq 50$

$0 \leq 50$

True, solution region is toward the origin.

$3x + y = 90$

x	0	30
y	90	0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put (0,0) in $3x+y \leq 90$

$0 \leq 90$

True, solution region is toward the origin.

So, the Solution region is ABCO.

corner Points are

A(0,50) B(x,y) C(30,0) O(0,0)

B

S

E

for B,

$$x + y = 50$$
$$-3x + -y = -90$$
$$-2x = -40$$
$$x = 20$$
$$y = 30$$

B(20,30)

Corner Points	$z = 4x + y$
(0,50) A	$z = 50$
(20,30) B	$z = 110$
(30,0) C	$z = 120$ (Max.)
(0,0) O	$z = 0$

कुल अंक

प्रश्न क्र.

Ans: The Maximum value is 120 at point C(30,0)

(Graph consider on Page 33).

BSE