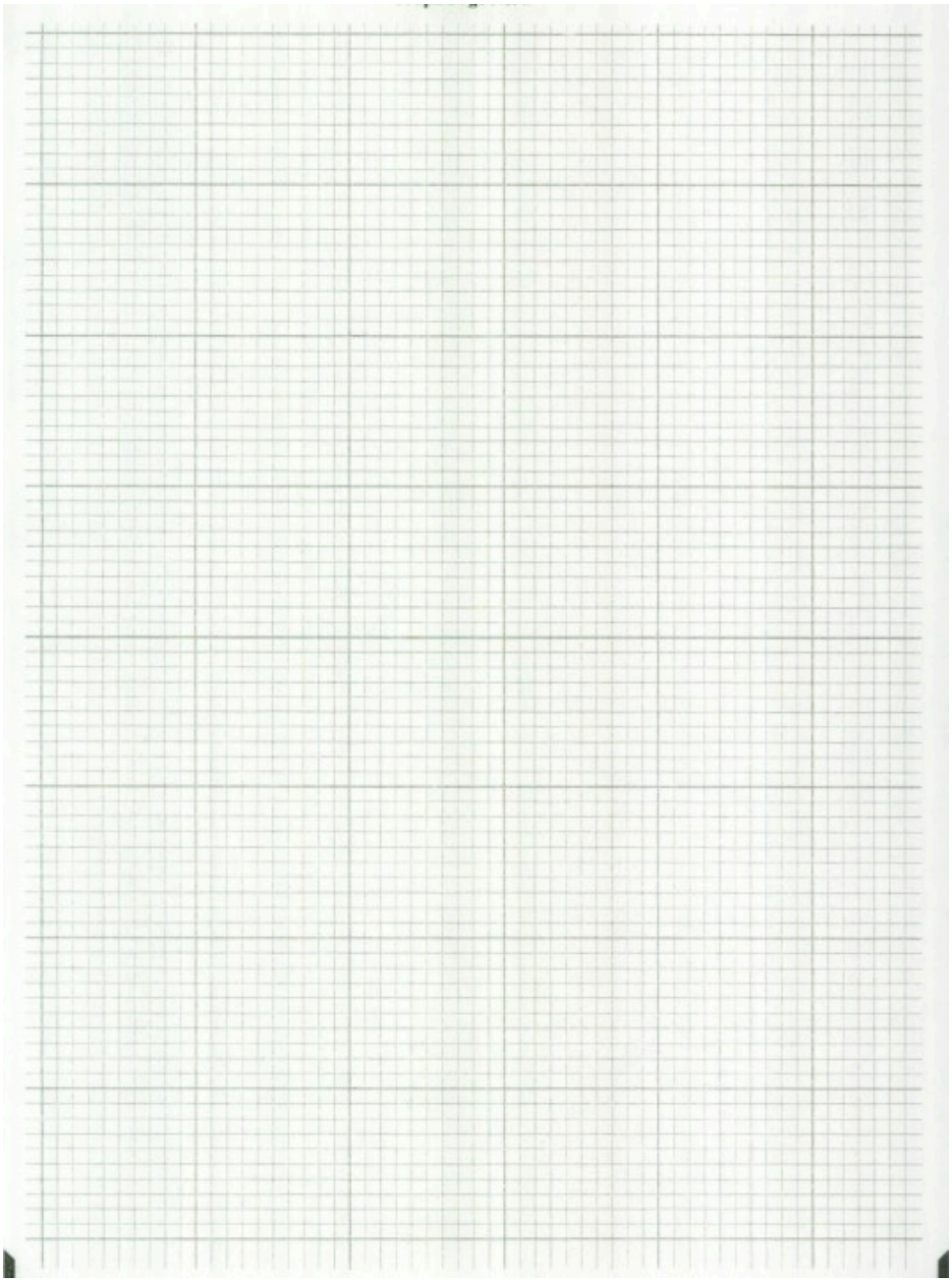
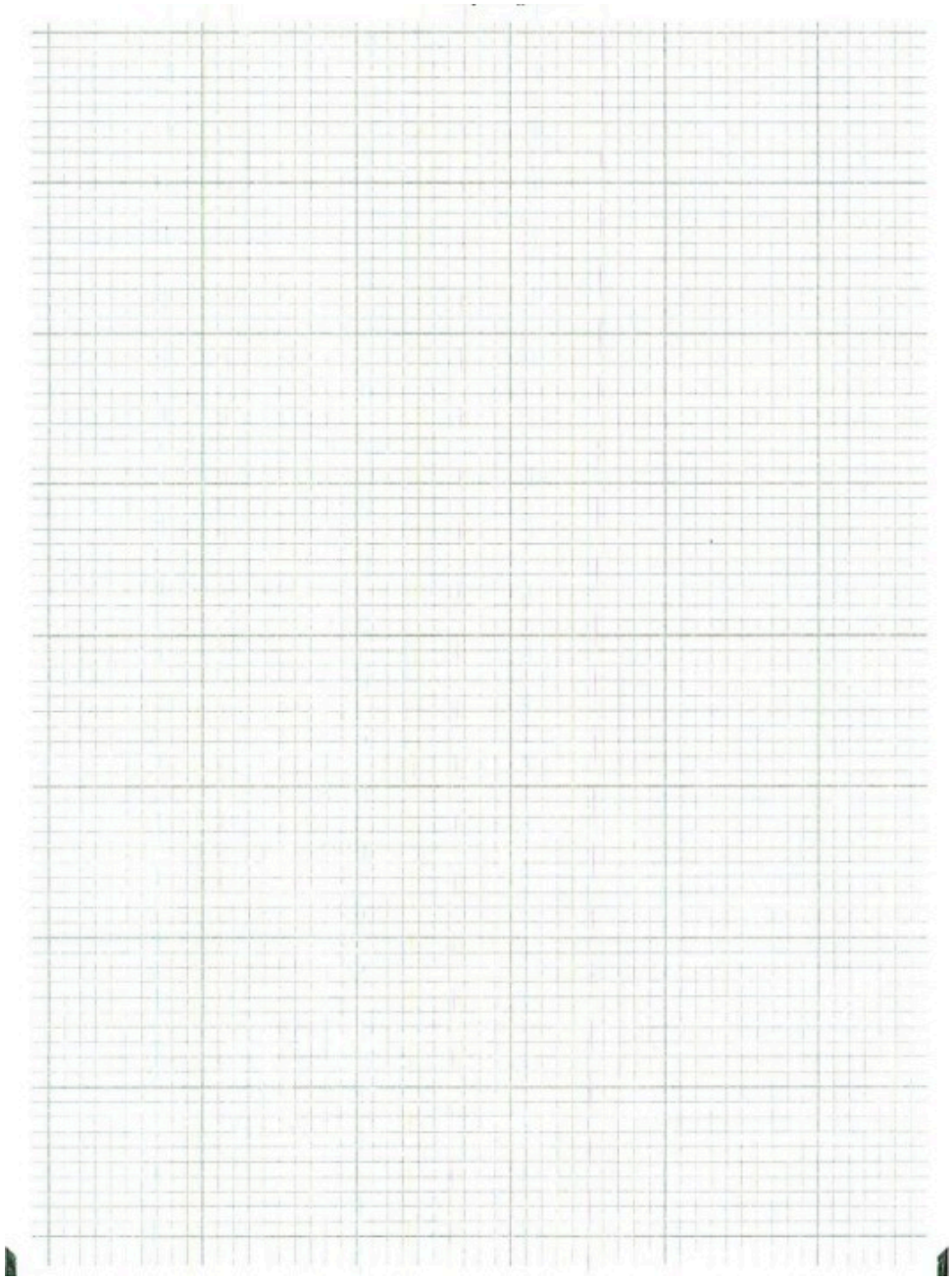
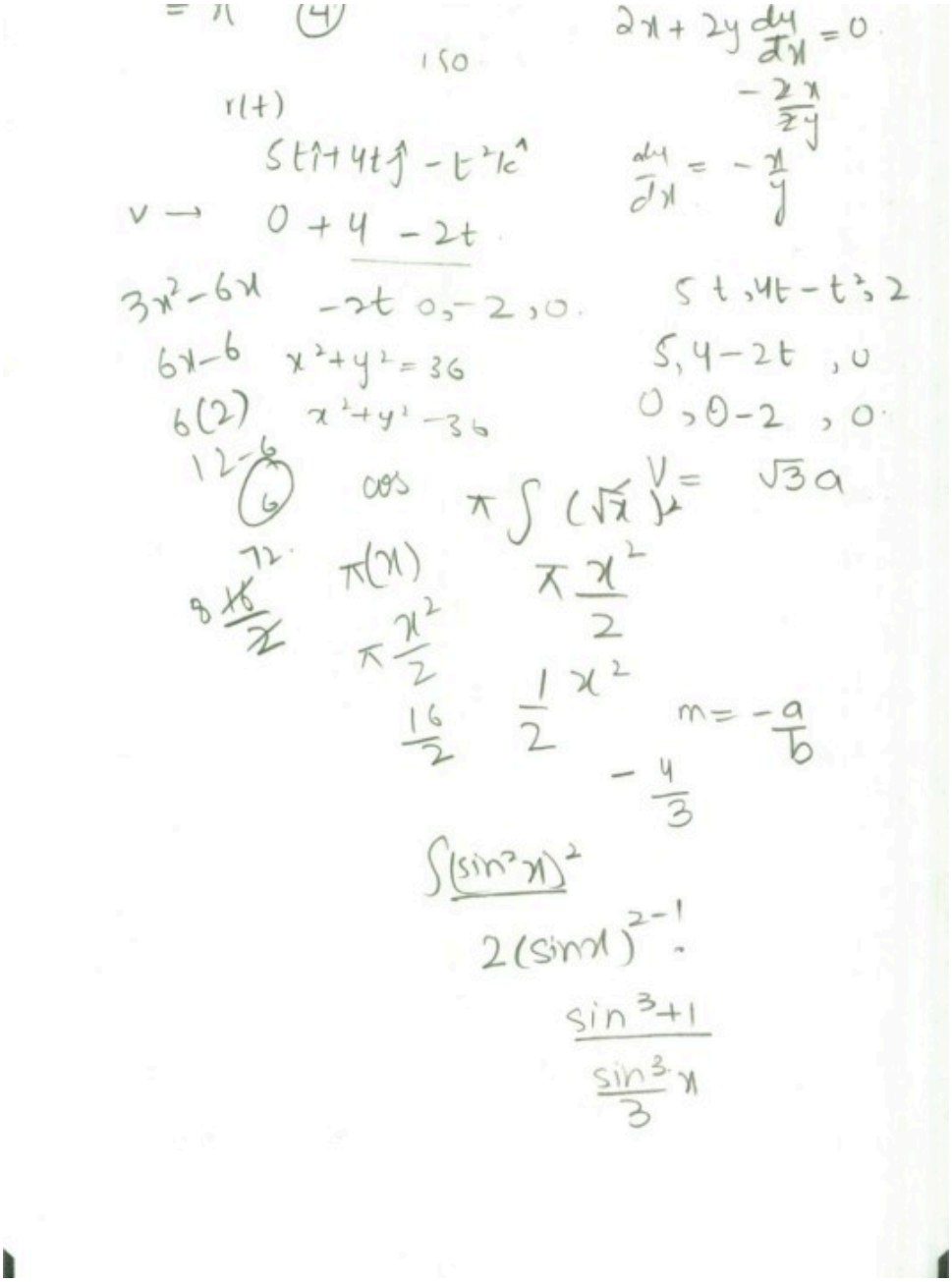
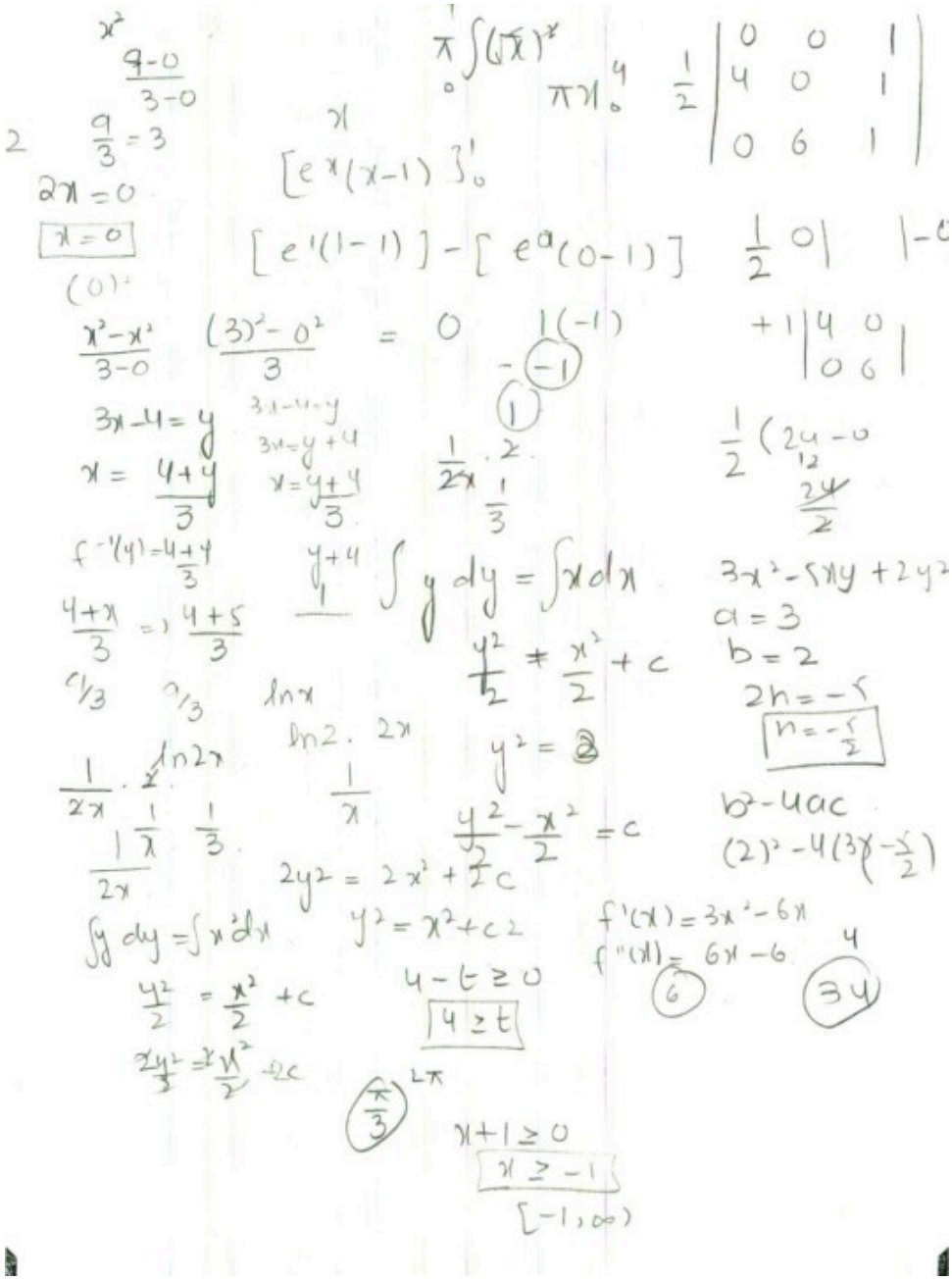





= π (4)
150
r(t)
5t î + 4t ĵ − t² k̂
v → 0 + 4 − 2t
3x² − 6x
−2t 0, −2, 0.
6x − 6
6(2)
12 − 6
cos
72
8 x 16 / 2
π(x)
π x²/2
16/2
2x + 2y dy/dx = 0
− 2x/2y
dy/dx = − x/y
5t, 4t − t², 2
5, 4 − 2t, 0
0, 0 − 2, 0
x² + y² = 36
x² + y² − 36
π ∫ (√x)
V = √3 a
π x²/2
1/2 x²
m = − a/b
− 4/3
∫(sin²x)²
2(sinx)^{2−1}.
sin³+1
sin³x/3



x^2

$\frac{9-0}{3-0}$

$\frac{9}{3}=3$

2

$2x=0$

$\boxed{x=0}$

$(0)^2$

$\frac{x^2-x^2}{3-0}$ $\frac{(3)^2-0^2}{3}=0$

$3x-4=y$

$x=\frac{4+y}{3}$

$f^{-1}(y)=\frac{4+y}{3}$

$\frac{4+x}{3} \Rightarrow \frac{4+5}{3}$

$c/3$ $a/3$

$\frac{1}{2x}\cdot\frac{\ln 2x}{x}$ $\frac{1}{x}$ $\frac{1}{3}$

$\frac{1}{2x}$

$\int y\,dy=\int x^2 dx$

$\frac{y^2}{2}=\frac{x^2}{2}+c$

$\frac{2y^2}{3}=\frac{x^2}{2}+2c$

$\int_0^1 (\sqrt{x})^x$

πx

$[e^x(x-1)]_0^1$

$[e^1(1-1)]-[e^0(0-1)]$

$1(-1)$

$-(-1)$

(1)

$\frac{1}{2x}\cdot 2$

$\frac{1}{3}$

$\frac{y+4}{1}$

$\int y\,dy=\int x\,dx$

$\frac{y^2}{2}=\frac{x^2}{2}+c$

$y^2=x^2$

$\frac{y^2}{2}-\frac{x^2}{2}=c$

$2y^2=2x^2+2c$

$y^2=x^2+c_2$

$4-t\geq 0$

$\boxed{4\geq t}$

$\frac{\pi}{3}$ 2π

$x+1\geq 0$

$\boxed{x\geq -1}$

$[-1,\infty)$

$\frac{1}{2}\begin{vmatrix} 0 & 0 & 1 \\ 4 & 0 & 1 \\ 0 & 6 & 1 \end{vmatrix}$

$\frac{1}{2}\begin{vmatrix} 4 & 0 \\ 0 & 6 \end{vmatrix}$

$\frac{1}{2}(24-0)$

$\frac{24}{2}$

$3x^2-5xy+2y^2$

$a=3$

$b=2$

$2h=-5$

$\boxed{h=-\frac{5}{2}}$

b^2-4ac

$(2)^2-4(3)(-\frac{5}{2})$

$f'(x)=3x^2-6x$

$f''(x)=6x-6$

(6)

4

(34)

Q. No. 2 Part (i) (Page 1) $f(x) = \frac{2x-3}{x+1}$

As, $f(x) = \frac{2x-3}{x+1}$ having,

Domain = $\mathbb{R} - \{-1\}$

Range = $\mathbb{R} - \{2\}$ ∵ Variable of x in N^r / Variable of x in D^r

Now,

Let,

$f(x) = y$

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

$y(x+1) = 2x-3$

$yx + y = 2x - 3$

$yx - 2x = -y - 3$

$x(y-2) = -(y+3)$

$x = \frac{-(y+3)}{y-2} \Rightarrow \frac{y+3}{2-y}$

now,

replace x by $f^{-1}(y)$

$f^{-1}(y) = \frac{y+3}{2-y}$

Now, replace y by x

So,

$f^{-1}(x) = \frac{x+3}{2-x}$

So Domain of $f^{-1}(x)$,

Q. No. 2 Part (i) (Page 2)

$$2 - y = 0$$

$$\boxed{2 = y}$$

Domain $= \mathbb{R} - \{2\}$

And, The range of $f^{-1}(x)$ is,

* Variable x in N^r
  Variable x in Dr

$$\mathbb{R} - \left\{\frac{1}{-1}\right\}$$

Range $= \mathbb{R} - \{-1\}$

Q. No. 2 Part (ii) (Page 1)

$$\frac{dy}{dx} \Rightarrow y = e^{2x}\ln(x)$$

To take the derivative, applying,

product rule $\Rightarrow$

$$f(x)g(x)\,dx = f(x)\,g'(x) + g(x)\,f'(x)$$

Now,

$$\frac{d}{dx}\left(e^{2x}.\ln(x)\right)$$

as $e^{2x} = f(x)$, $\ln(x) = g(x)$.

$$\frac{d}{dx}\left(e^{2x}.\ln x\right) = e^{2x}\frac{d}{dx}(\ln x) + \ln x \frac{d}{dx}(e^{2x})$$

$$= e^{2x}\left(\frac{1}{x}\right) + \ln x\,(e^{2x}.2)$$

$$= \frac{e^{2x}}{x} + \ln x\,(2e^{2x})$$

$$= \frac{e^{2x}}{x} + 2\ln x\, e^{2x}$$

$$= \frac{e^{2x} + 2x\ln x.e^{2x}}{x}$$

So

$\frac{dy}{dx}$ of $e^{2x}\ln(x)$ is $\frac{e^{2x} + 2x\ln x\, e^{2x}}{x}$

Q. No. 2 Part (ii) (Page 2)

Q. No. 2 Part (iii) (Page 1)

Evaluate, $\int \sin^2 x \, dx$

$\int 1.(\sin x)^2 \, dx$

By integration by parts,

$\int f_1 f_2 dx = f_1 \int f_2 dx - \int \{ f_1' \int f_2 dx \} dx$

$\int 1.(\sin x)^2 dx = \sin^2 x \int 1 dx - \int \{ 2\sin x \frac{d}{dx}(\sin x) \int 1 dx \} dx$

$= \sin^2 x \cdot x - \int \{ 2\sin x \cdot \frac{d}{dx}(x) \cdot (x) \} dx$

$= x\sin^2 x - \int [2\sin x (1) \cdot x] dx$

$= x\sin^2 x - 2\int \sin x \cdot x \, dx$

$= x\sin^2 x - 2[\because (-\cos x) \cdot x] + c$

$= x\sin x + 2\cos x \cdot x + c$

$= x\sin x + 2x\cos x + c$

$= x[\sin x + 2\cos x] + c$

⟶ next page.

Q. No. 2 Part (iii) (Page 2)

as,

$$\sin^2 x = \frac{1-\cos 2x}{2}$$

$$= \int \left(\frac{1-\cos 2x}{2}\right) dx$$

$$= \int \frac{1}{2} dx - \int \left(\frac{\cos 2x}{2}\right) dx$$

$$= \frac{1}{2}\int 1\, dx - \frac{1}{2}\int \cos 2x\, dx$$

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

$$= \frac{1}{2}x - \frac{1}{4}\sin 2x + c.$$

So,

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

Q. No. 2 Part (iv) (Page 1)

$$\frac{dy}{dx} = \frac{y+1}{x-2}$$

As,

$$\frac{dy}{dx} = \frac{y+1}{x-2}$$

$$\frac{1}{y+1}\,dy = \frac{1}{x-2}\,dx$$

Now, **integrating** on both sides.

$$\int \frac{1}{y+1}\,dy = \int \frac{1}{x-2}\,dx$$

$$\ln|y+1| = \ln|x-2| + \ln c$$

$$\ln|y+1| = \ln(x-2)c$$

∵ canceling ln on bothsides.

$$y+1 = (x-2)c$$

$$y+1 = xc-2c$$

$$xc-y-1-2c = 0$$

as $c = 2c$ ∵

So,

$$y+1 = (x-2)c \quad \text{Ans.} \Rightarrow y = (x-2)c-1$$

Q. No. 2 Part (iv) (Page 2)

Q. No. 2 Part (v) (Page 1)

$3x^2 - 5xy + 2y^2 = 0$

(a)

Comparing,

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

$a = 3, \quad 2h = -5, \quad b = 2$

$h = \frac{-5}{2}$

Now,

$$\tan\theta = \frac{h\sqrt{h^2 - ab}}{a + b}$$

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

-no need.

$$= \frac{-\frac{5}{2}\sqrt{\frac{25}{4} - 6}}{3+2}$$

$$= \frac{-\frac{5}{2}\left(\frac{1}{2}\right)}{5}$$

$$= \frac{-\frac{5}{4}}{5}$$

→ next page.

$\tan\theta = -\frac{1}{4}$

Q. No. 2 Part (v) (Page 2)

$3x^2 - 5xy + 2y^2 = 0$

(b)

$3x^2 - 5xy + 2y^2 = 0$

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

$3x(x-y) - 2y(x-y) = 0$

$(3x-2y)(x-y) = 0$

$3x - 2y = 0$ ① $x - y = 0$ ②

(a)

from ①: $-2y = -3x$, $y = \frac{3}{2}x$

from ②: $+y = +x$, $y = x$

now, $y = -\frac{1}{m}x$

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

∴ form equation,

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

$x + y = 0$. ④

Solving, eq ③ × ④

$(2x+3y)(x+y) = 0$

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

$2x^2 + 5xy + 3y^2 = 0$ Ans.

Q. No. 2 Part (vi) (Page 1)

$r(t) = \langle t^2-1, 3t, \ln(t+1) \rangle$

$r'(t) = ?$ when $r'(2)$

$$\frac{dr}{dt} = \frac{d}{dt}\left(t^2-1\,\hat{i} + 3t\,\hat{j} + \ln(t+1)\,\hat{k}\right)$$

$$= \left[(2(t)^{2-1}\frac{d}{dt}(t) - 0)\hat{i} + 3(1)\hat{j} + \frac{1}{t+1}\frac{d}{dt}(t)\right.$$

$$v(t) = (2t-0)\hat{i} + 3\hat{j} + \frac{1}{t+1}(1)\hat{k}$$

$$v(t) = 2t\hat{i} + 3\hat{j} + \frac{1}{t+1}\hat{k}$$

So,

$$r'(t) = 2t\hat{i} + 3\hat{j} + \frac{1}{t+1}\hat{k}$$

Ly.

Now

$r'(2)$

$$r'(2) = 2(2)\hat{i} + 3\hat{j} + \frac{1}{2+1}\hat{k}$$

$$r'(2) = 4\hat{i} + 3\hat{j} + \frac{1}{3}\hat{k}$$

Now

$$|r'(2)| = \sqrt{(4)^2 + (3)^2 + \left(\frac{1}{3}\right)^2}$$

$$|r'(2)| = \sqrt{16 + 9 + \frac{1}{9}} = \frac{\sqrt{226}}{3}$$

Q. No. 2 Part (vi) (Page 2)

Q. No. 2 Part (vii) (Page 1)

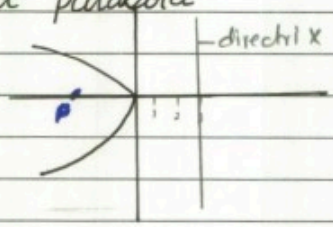
Parabola, $y^2 = -12x$

as,

It is a leftward parabola

so,

$y^2 = -4ax$



comparing,

$+4a = +12$

$a = \frac{12}{4} \frac{3}{1}$

$a = 3$

To find,

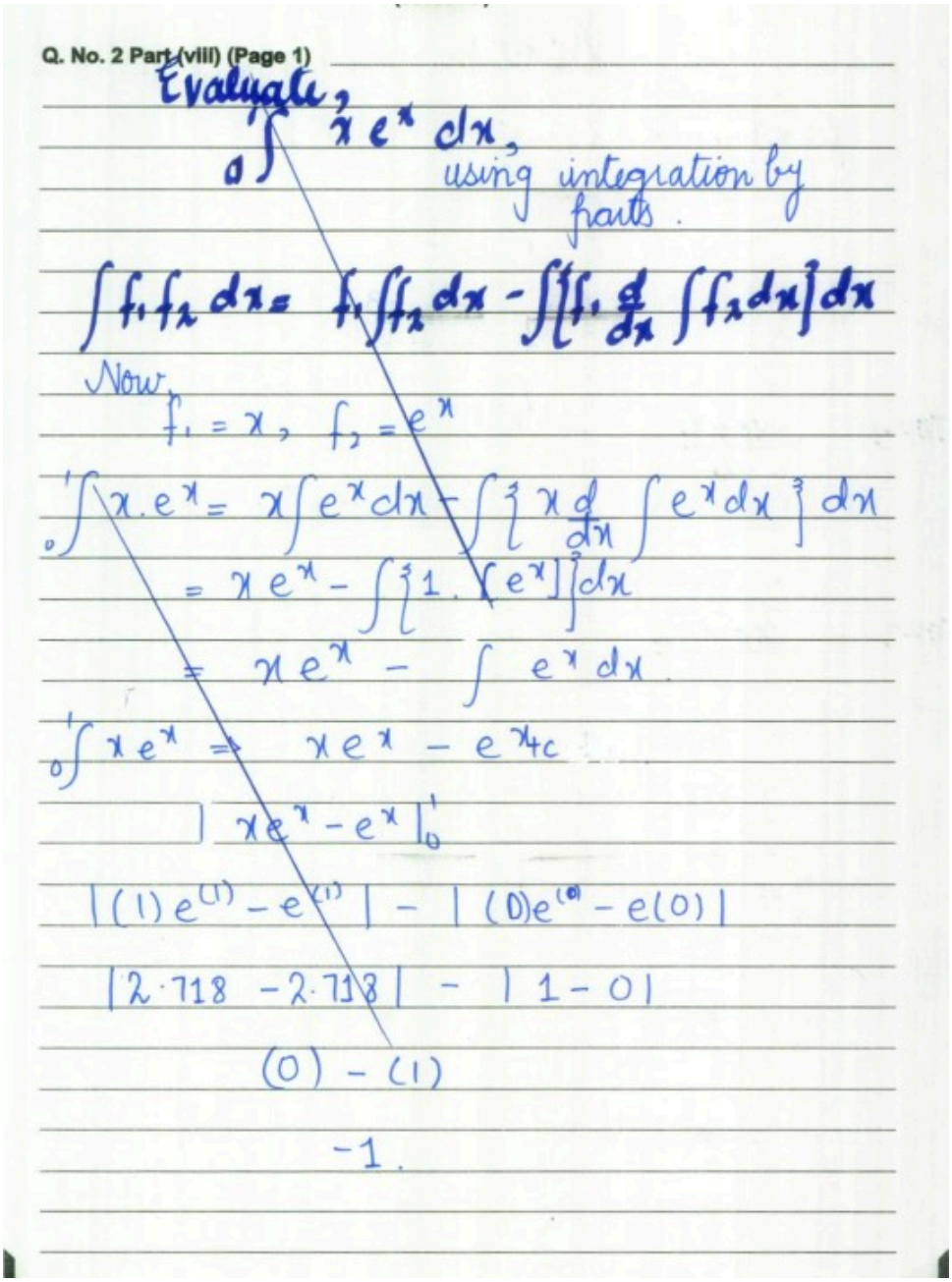
Vertex, $(0,0)$

Focus, $(-a, 0) \Rightarrow (-3, 0)$

Directrix, $x = a \Rightarrow x = 3$

length of latus rectum, $4a = 4(3) = 12$

Q. No. 2 Part (vii) (Page 2)



Q. No. 2 Part (viii) (Page 1)

Evaluate, $\int_0^1 x e^x dx$, using integration by parts.

$$\int f_1 f_2 dx = f_1 \int f_2 dx - \int \left[f_1' \frac{d}{dx} \int f_2 dx \right] dx$$

Now,

$f_1 = x, \quad f_2 = e^x$

$$\int_0^1 x.e^x = x\int e^x dx - \int \left\{ x \frac{d}{dx} \int e^x dx \right\} dx$$

$$= xe^x - \int \{1.[e^x]\} dx$$

$$= xe^x - \int e^x dx$$

$$\int_0^1 xe^x \Rightarrow xe^x - e^x + c$$

$$|xe^x - e^x|_0^1$$

$$|(1)e^{(1)} - e^{(1)}| - |(0)e^{(0)} - e(0)|$$

$$|2.718 - 2.718| - |1 - 0|$$

$$(0) - (1)$$

$$-1.$$

Q. No. 2 Part (viii) (Page 2) **Bisection Method,**

$f(x) = x^3 - 2x - 5 \qquad [2,3]$

Here, $x_0 = 2, \quad x_1 = 3$

Now,

$f(x_0) = (2)^3 - 2(2) - 5 = -1$

$f(x_1) = (3)^3 - 2(3) - 5 = 16$ as, $f(x_0)f(x_2) < 1$ so we proceed

now,

STEP-1 $x_2 = \frac{x_0 + x_1}{2} = \frac{+2+3}{2} = \frac{5}{2}$

$f(x_2) = (5/2)^3 - 2(5/2) - 5 = \frac{45}{8}$ or 5.625

as $f(x_2)f(x_0) < 1$ so we proceed

STEP-2 $x_3 = \frac{x_0 + x_2}{2} = \frac{2 + 2.5}{2} = 2.25$

$f(x_3) = (2.25)^3 - 2(2.25) - 5 = 1.890625$

as $f(x_3)f(x_0) < 1$ so we proceed.

Here, is the first two Iteration. of $f(x) = x^3 - 2x - 5$

Q. No. 2 Part (ix) (Page 1)

Evaluate $\int_0^1 x e^x$

$$\int f_1 f_2 dx = f_1 \int f_2 dx - \int \left\{ f_1' \frac{d}{dx} \int f_2 dx \right\} dx$$

As, $f_1 = x, \quad f_2 = e^x$

$$\int_0^1 x.e^x dx = x\int e^x dx - \int \left\{ x \frac{d}{dx} \int e^x dx \right\} dx$$

$$= xe^x - \int \{1 . e^x\} dx$$

$$= xe^x - \int e^x dx$$

$$\int_0^1 x.e^x = xe^x - e^x + c$$

Now,

$$|xe^x - e^x|_0^1$$

$$|(1)e^1 - e^1| - |0(e^0) - e^0|$$

$$(e^1 - e^1) - |(1)0 - 1|$$

$$0 - |0-1|$$

$$-(-1)$$

$$1.$$

Q. No. 2 Part (ix) (Page 2)

Q. No. 2 Part (x) (Page 1)

Area,

$y = x^2 + 2$ $\quad x = 1, x = 3$

As,

$$\text{Area} = \int_a^b f(x)\,dx$$

$$= \int_1^3 (x^2 + 2)\,dx$$

$$= \left| \frac{x^3}{3} + 2x \right|_1^3$$

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

$$= \left| \frac{27}{3} + 6 \right| - \left| \frac{1}{3} + 2 \right|$$

$$= 15 - \frac{7}{3}$$

$$= \frac{15(3) - 7}{3}$$

$$= \frac{45 - 7}{3}$$

$$\text{Area} = \frac{38}{3} \text{ sq units}$$

Q. No. 2 Part (x) (Page 2)

Q. No. 2 Part (xi) (Page 1)

Derivative,

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

Now,

By the Quotient rule,

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

$\Rightarrow$ putting values.

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

$$= \frac{(x^2-1)\left(\frac{d}{dx}(x^2)+\frac{d}{dx}(1)\right) - (x^2+1)\left(\frac{d}{dx}(x^2)-\frac{d}{dx}(1\right.}{(x^2-1)^2}$$

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

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

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

Taking, $2x$ common

$$2x\ \frac{[x^2-1-[x^2+1]]}{x^2-2x+1}$$

$\because (a-b)^2 = a^2-2ab+b^2$

Q. No. 2 Part (xi) (Page 2)

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

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

$$\Rightarrow \frac{-4x}{x^2-2x+1}$$

$f(x) = \frac{x^2+1}{x^2-1}$ gives the $f'(x) = \frac{-4x}{x^2-2x+1}$

Q. No. 2 Part (xii) (Page 1) $f(x) = \sqrt{x-1}$

$f^{-1}(x) = ?$

As

$f(x) = \sqrt{x-1}$

replace $f(x)$ by y

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

$y^2 = ((x-1)^{1/2})^2$ taking square on b.s

$y^2 = x+1$

$y^2 + 1 = x$

now replace x by $f^{-1}(y)$,

$f^{-1}(y) = y^2 + 1$

Now replace y by x,

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

Now, Verify, $f(f^{-1}(x)) = x$

L.H.S, $\sqrt{(x^2+1)-1} = f(x)$

$= \sqrt{x^2+1-1}$

Q. No. 2 Part (xii) (Page 2)

$\sqrt{x^2}$

$x = R.H.S$

So, $f(f^{-1}(x))$ is verified.

(Section C)

Q. No. 3 (Page 1)

$$f(x)=\begin{cases} ax^2+bx+2, & x\le 1 \\ 3x+a, & 1<x<3 \\ \frac{2x^2+b}{x}, & x\ge 3 \end{cases}$$

Given, $f(x)$ is continuous at $x=1$ & $x=3$,

find, $a=?$ $b=?$

When, $f(x)$ is continuous at $x=1$.

$$\lim_{x\to 1} f(1) = a(1)^2+b(1)+2 = a+b+2$$

Now,

L.H.L,

$$\lim_{x\to 1^-} (ax^2+bx+2) = a(1)^2+b(1)+2 = a+b+2$$

So, $\lim_{x\to 1^-}(ax^2+bx+c) = a+b+c$

Now,

R.H.L

$$\lim_{x\to 1^+} (3x+a) = 3(1)+a = 3+a$$

$$\lim_{x\to 1^+} (3x+a) = 3+a$$

Now, for $f(1)$ is continuous at $x3$

Q. No. 3 (Page 2) $\lim_{x\to 3}\left(\frac{2x^2+b}{x}\right) = \frac{2(3)^2+b}{3}$

$\lim_{x\to 3}\left(\frac{2x^2+b}{x}\right) = \frac{18+b}{3}$

Now,

L.H.L, (left hand limit)

$\lim_{x\to 3^-}(3x+a) \Rightarrow 3(3)+a$

$9+a.$

$\lim_{x\to 3}(3x+a) = 9+a$

Right-Hand limit,

$\lim_{x\to 3^+}\left(\frac{2x^2+b}{x}\right) = \frac{2(3)^2+b}{3}$

$\lim_{x\to 3^+}\left(\frac{2x^2+b}{x}\right) = \frac{18+b}{3}$

Now,

as $f(x)$ is continuous on 1,

$a+b+2 = a+b+2 = 3+a$

$a+b+2 = 3+a$

$a-a+b+2 = 3$

$b+2 = 3 \longrightarrow (1)$

$b = 3-2 \Rightarrow b = 1$

and

$a+b+c = a+b+c$

$a-a+b-b+c-c = 0$

$0+0+0 = 0$

$0 = 0.$

Q. No. 3 (Page 3) as $f(x)$ is continuous on 3.

$$\frac{18+b}{3} = 9+a = \frac{18+b}{3}$$

$$\frac{18+b}{3} = 9+a$$

$$18+b = 3(9+a)$$

$$18+b = 3(9) + 3a$$

$$18+b = 27 + 3a$$

$$3a - b + 9 = 0 \longrightarrow (2)$$

put $b = 1$ in eq (2)

$$3a - 1 + 9 = 0$$

$$3a + 8 = 0$$

$$a = \frac{-8}{3}$$

So,

$$a = -\frac{8}{3}$$

Value of $a = -8/3$

Value of $b = 1$

$$\left\{-\frac{8}{3}, 1\right\}$$

Q. No. 3 (Page 4)

Q. No. 4 (Page 1)

Draw, $y = \sin^{-1}(x)$, $x \in [-2\pi, 2\pi]$

Table,

x	
$f(x)$	

Domain of $\sin^{-1}(x)$ = $[-1, 1]$

Range of $\sin^{-1}(x)$ = $[-2\pi, 2\pi]$

" Intercepts,

→ next page.

Q. No. 4 (Page 2)

$f(x) = 2\sin x + \cos 2x$

$x \in [0, \pi]$

(a) $f'(x) = \frac{d}{dx}(2\sin x + \cos 2x)$

$2\frac{d}{dx}\sin x + \frac{d}{dx}\cos 2x$

$f'(x) = 2\cos x - 2\sin 2x$

put $f'(x) = 0$

$2\cos x - 2\sin 2x = 0$.

$2\cos x - 2[2\sin x \cos x] = 0$ $\quad \because \sin 2x = 2\sin x \cos x$

$2\cos x - 4\sin x \cos x = 0$

$2[\cos x - 2\sin x \cos x] = 0$

$\cos x - 2\sin x \cos x = 0$

$\cos x (1 - 2\sin x) = 0$.

$\cos x = 0$, $1 - 2\sin x = 0$.

$\therefore x = \cos^{-1}(0)$, $1 = 2\sin x$

$x = \frac{\pi}{2}$ $\quad \frac{1}{2} = \sin x$

$x = \sin^{-1}\left(\frac{1}{2}\right)$

, $x = \frac{\pi}{6}$

Critical values $= \frac{\pi}{2}, \frac{\pi}{6}$

Q. No. 4 (Page 3)

Now,

(b)

$$f''(x) = \frac{d}{dx}(2\cos x - 2\sin 2x)$$

$$2\frac{d}{dx}\cos x - 2\frac{d}{dx}\sin 2x.$$

$$-2\sin x - 2\cos 2x.2$$

$$f''(x) = -2\sin x - 4\cos 2x \longrightarrow (i)$$

put critical value in eq(i),

$$f''\left(\frac{\pi}{2}\right) = -2\sin\left(\frac{\pi}{2}\right) - 4\cos 2\left(\frac{\pi}{2}\right) = 2$$

$$f''\left(\frac{\pi}{6}\right) = -2\sin\left(\frac{\pi}{6}\right) - 4\cos 2\left(\frac{\pi}{6}\right) = -3$$

$f''\left(\frac{\pi}{2}\right) = 2$, $2 > 0$ local minimum

$f''\left(\frac{\pi}{6}\right) = -3$, $-3 < 0$ local maximum

(c) $f\left(\frac{\pi}{2}\right) = 2\sin\left(\frac{\pi}{2}\right) + \cos 2\left(\frac{\pi}{2}\right) = 1$

$f\left(\frac{\pi}{6}\right) = 2\sin\left(\frac{\pi}{6}\right) + \cos 2\left(\frac{\pi}{6}\right) = \frac{3}{2}$

$f\left(\frac{\pi}{2}\right) = 1 > 0$ absolute maximum

$f\left(\frac{\pi}{6}\right) = \frac{3}{2} > 0$ absolute minimum

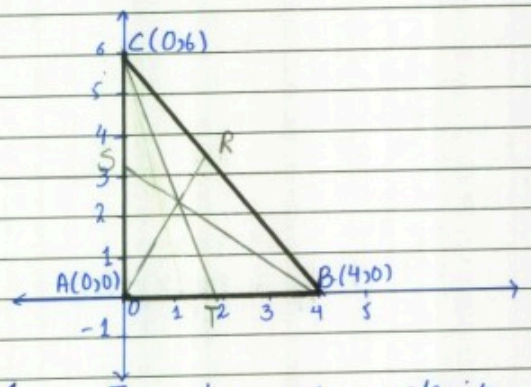
There is no absolute maximum value.

Q. No. 4 (Page 4)

Q. No. 5 (Page 1)

Vertices
A(0,0), B(4,0), C(0,6)

» Median



Let R, S, T be the midpoints of sides CB, CA, AB respectively of Δ ABC

First Midpoints, (Midpoints

$$R\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{0+4}{2}, \frac{0+6}{2}\right) = R(2,3)$$

$$S\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{0+0}{2}, \frac{6+0}{2}\right) = S(0,3)$$

$$T\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{0+4}{2}, \frac{0+0}{2}\right) = T(2,0)$$

Now,
Find the median by the help of slope of midpoint and midpoint.

Q. No. 5 (Page 2)

Median of RA:

$R(2,3)$, $A(0,0)$

Slope of $RA = \frac{y_2-y_1}{x_2-x_1} = \frac{0-3}{0-2} = \frac{-3}{-2}$

$\Rightarrow$ Slope of $RA = \frac{3}{2}$

Now,

$m = 3/2$, $R(2,3)$

$y - y_1 = m(x-x_1)$

$y - 3 = \frac{3}{2}(x-2)$

$2(y-3) = 3(x-2)$

$2y - 6 = 3x - 6 \Rightarrow 3x - 2y - 6 + 6 = 0$

$3x - 2y = 0. \longrightarrow (1)$

Median of SB:

$S(0,3)$, $B(4,0)$.

Slope of $SB = \frac{y_2-y_1}{x_2-x_1} = \frac{0-3}{4-0} = \frac{-3}{4}$

$\Rightarrow$ Slope of $SB = -\frac{3}{4}$

Now,

$m = \frac{-3}{4}$, $S(0,3)$

$y - y_1 = m(x-x_1)$

$y - 3 = -\frac{3}{4}(x-0)$

$4y - 12 = -3(x)$

$4y - 12 = -3x$

$3x + 4y - 12 = 0 \longrightarrow (2)$

Q. No. 5 (Page 3) **Median of TC:**

T(2,0), C(0,6)

Slope of $TC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-0}{0-2} = \frac{6}{-2} = -3$.

Slope of TC $= -3$

Now, $\because y - y_1 = m(x - x_1)$

T(2,0), $m = -2$.

$y - 0 = (-3)(x - 2)$

$y = -3x + 6$.

$3x + y - 6 = 0 \longrightarrow (3)$

Now, To verify,

$$\begin{vmatrix} 3 & -2 & 0 \\ 3 & 4 & -12 \\ 3 & 1 & -6 \end{vmatrix}$$

$$3\begin{vmatrix} 4 & -12 \\ 1 & -6 \end{vmatrix} - (-2)\begin{vmatrix} 3 & -12 \\ 3 & -6 \end{vmatrix} - 0\begin{vmatrix} 3 & 4 \\ 2 & 1 \end{vmatrix}$$

$3(-24 + 12) + 2(-18 + 36) - 0(3 - 8)$

$3(-4) + 2(24) = 0$

$-12 + 24$

$3(-12) + 2(18)$

$-36 + 36$

0

As the determinant is equal to zero so three medians are **concurrent.**

Q. No. 5 (Page 4)

Point of concurrency (centriod)

from eq(1),

$$3x - 2y = 0$$

$$3x = 2y$$

$$\boxed{x = \frac{2y}{3}} \rightarrow (4)$$

Put in eq (3)

$$3\left(\frac{2y}{3}\right) + y - 6 = 0$$

$$2y + y - 6 = 0$$

$$3y - 6 = 0$$

$$3y = 6$$

$$y = 2$$

for x,

Put in eq(4)

$$x = \frac{2(2)}{3} = \frac{4}{3}$$

$$x = \frac{4}{3}$$

The points of concurrency is $\left(\frac{4}{3}, 2\right)$

Put in eq (2)

$$3\left(\frac{4}{3}\right) + 4(2) - 12 = 0$$

$$4 + 8 - 12 =$$

$$12 - 12 = 0$$

$$0 = 0$$

Proved

Q. No. 6 (Page 1)

$$\frac{dy}{dx} = \frac{x^2+y^2}{xy}$$

As,

$$\frac{dy}{dx} = v + x\frac{dv}{dx}$$

and $y = vx$

putting,

$$v + x\frac{dv}{dx} = \frac{x^2 + (vx)^2}{x(vx)}$$

$$v + x\frac{dv}{dx} = \frac{x^2 + v^2x^2}{x^2v}$$

$$v + x\frac{dv}{dx} = \frac{x^2(1+v^2)}{x^2v}$$

$$v + x\frac{dv}{dx} = \frac{1+v^2}{v}$$

$$x\cdot\frac{dv}{dx} = \frac{1+v^2}{v} - v$$

$$x\frac{dv}{dx} = \frac{1+v^2-v^2}{v}$$

Q. No. 6 (Page 2)

$$x\frac{dv}{dx} = \frac{1}{v}$$

∵ Separating Variables

$$v\,dv = \frac{1}{x}\,dx$$

∴ Integrating on both Sides

$$\int v\,dv = \int \frac{1}{x}\,dx$$

$$\frac{v^2}{2} = \ln x + c$$

put $\Rightarrow y = vx$ from $v = \frac{y}{x}$

$$\frac{\left(\frac{y}{x}\right)^2}{2} = \ln x + c$$

$$\frac{1}{2}\cdot\frac{y^2}{x^2} = \ln x + c$$

$$\frac{y^2}{2x^2} = \ln x + c$$

$$y^2 = 2x^2\ln x + 2x^2c$$

$$y^2 = 2x^2\ln x + 2x^2c$$

$$2x^2\ln x - y^2 + 2x^2c$$

where,

Q. No. 6 (Page 3)

$2x^2c = c$

$y^2 = x^2 \ln x^2 + 2x^2c$

Q. No. 6 (Page 4)