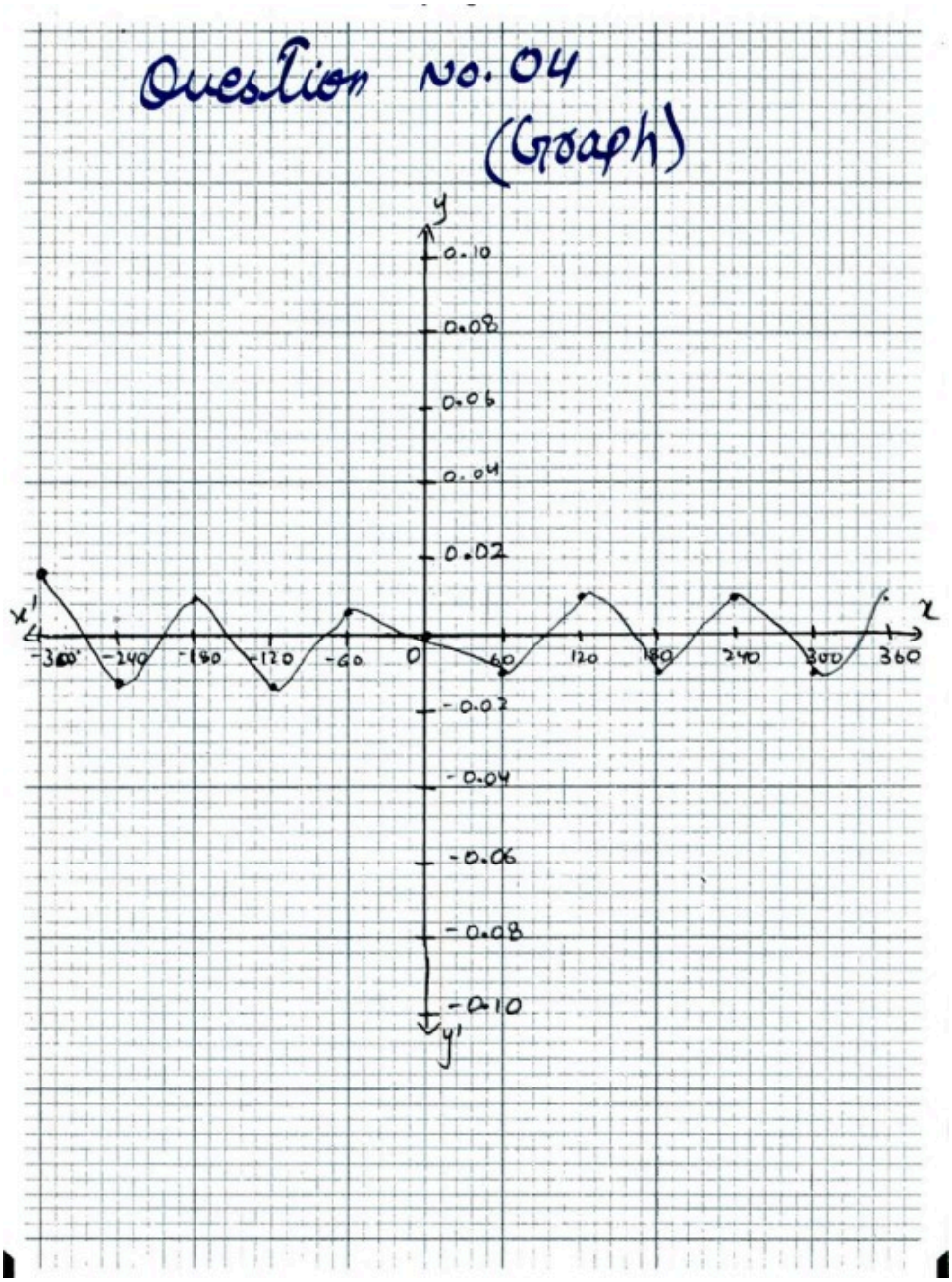
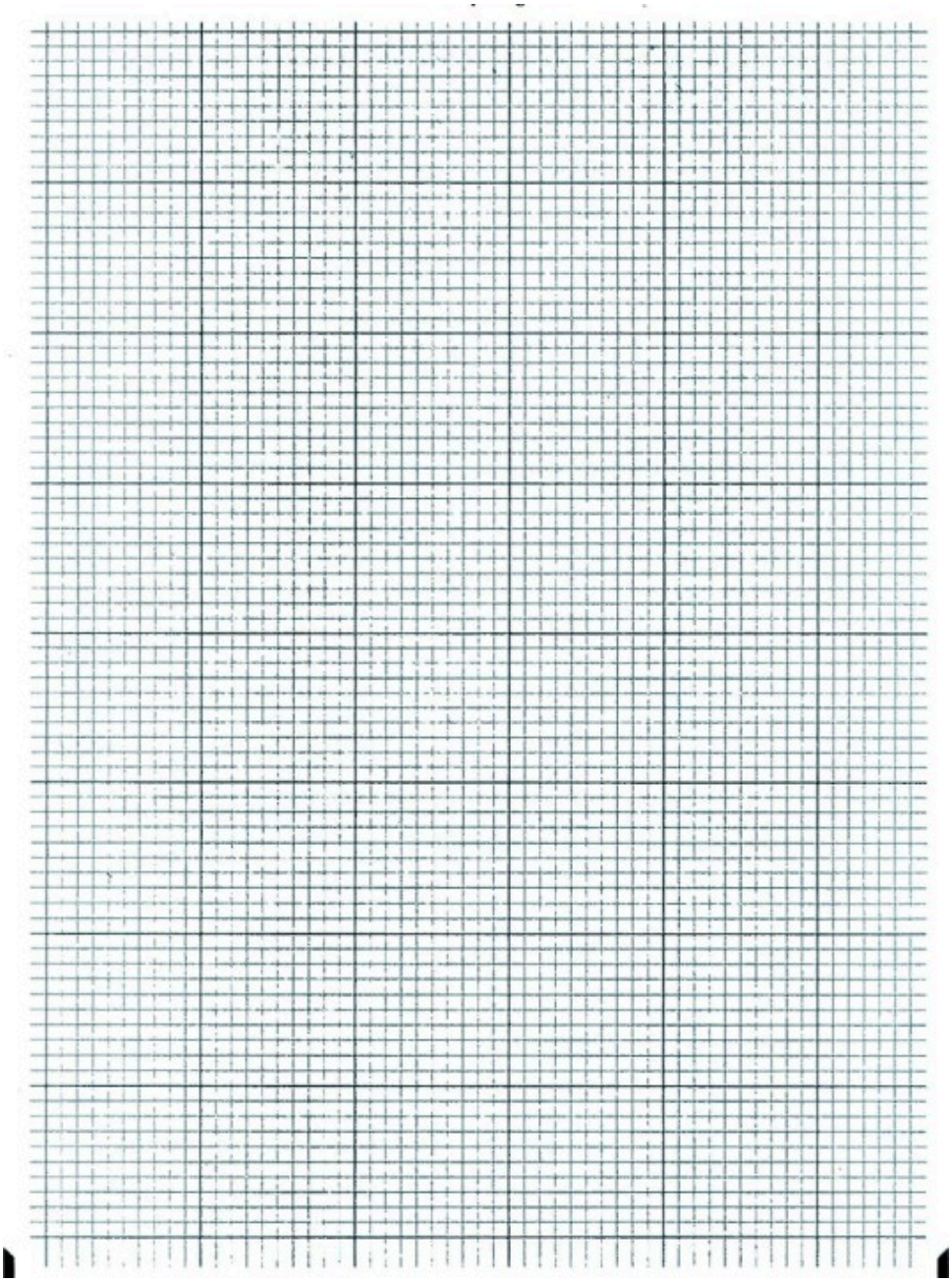

Question No. 04
(Graph)
y
0.10
0.08
0.06
0.04
0.02
x'
x
-300
-240
-180
-120
-60
0
60
120
180
240
300
360
-0.02
-0.04
-0.06
-0.08
-0.10
y'



$f(x) = \ln(2x)$

$y = \ln(2x)$

$e^y = 2x$

$x = \frac{e^y}{2}$

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

$\ln y = 2 + x$

$x = \ln x - 2$

$f(x) = \ln(2x)$

$f'(x) = \frac{1}{2x}(2)$

$= \frac{2}{x}$

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

$\sin^2 x = \cos 2x$

$\sin^2 x = \cos 2x + 1 - \sin^2 x$

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

$\frac{1}{16}(2x) - \frac{2y}{9}\frac{dy}{dx} = 0$

$\frac{1}{8}x - \frac{2y}{9}$

$\frac{dy}{dx} = \frac{x/8}{2y/9} \times \frac{9}{2y}$

$\frac{9x}{16y}$

$\begin{vmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 6 & 1 \end{vmatrix}$

$+1(2y)$

$2x + 2y\frac{dy}{dx} = 0$

~~$2(3) + 2$~~

$3 + 4\frac{dy}{dx} = 0$

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

$$\Rightarrow \frac{Ax+B}{x^2+2x+5} + \frac{C}{x-1}$$

$$\frac{x}{x^2+2x+5} + \frac{1}{x-1}$$

$$x^2+2x+5 \overline{)\; x \;(\; 1}$$

$\sin \to \cos x$

$\cos \to -\sin x$

$\ln(x-1)$

$\cos 2\theta = \cos^2 x - \sin^2 x$

$= 1 - \sin$

$= 1 - \sin^2 x - \sin^2 x$

$\cos 2\theta = 1 - 2\sin^2 x$

$2\sin^2 \theta = 1 - \cos 2\theta$

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

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

Solution:

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

let $f(x) = y$

$$x = f^{-1}(y) \quad \text{---(1)}$$

Now,

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

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

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

$$xy - 2x = -3-y$$

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

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

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

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

Using (1)

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

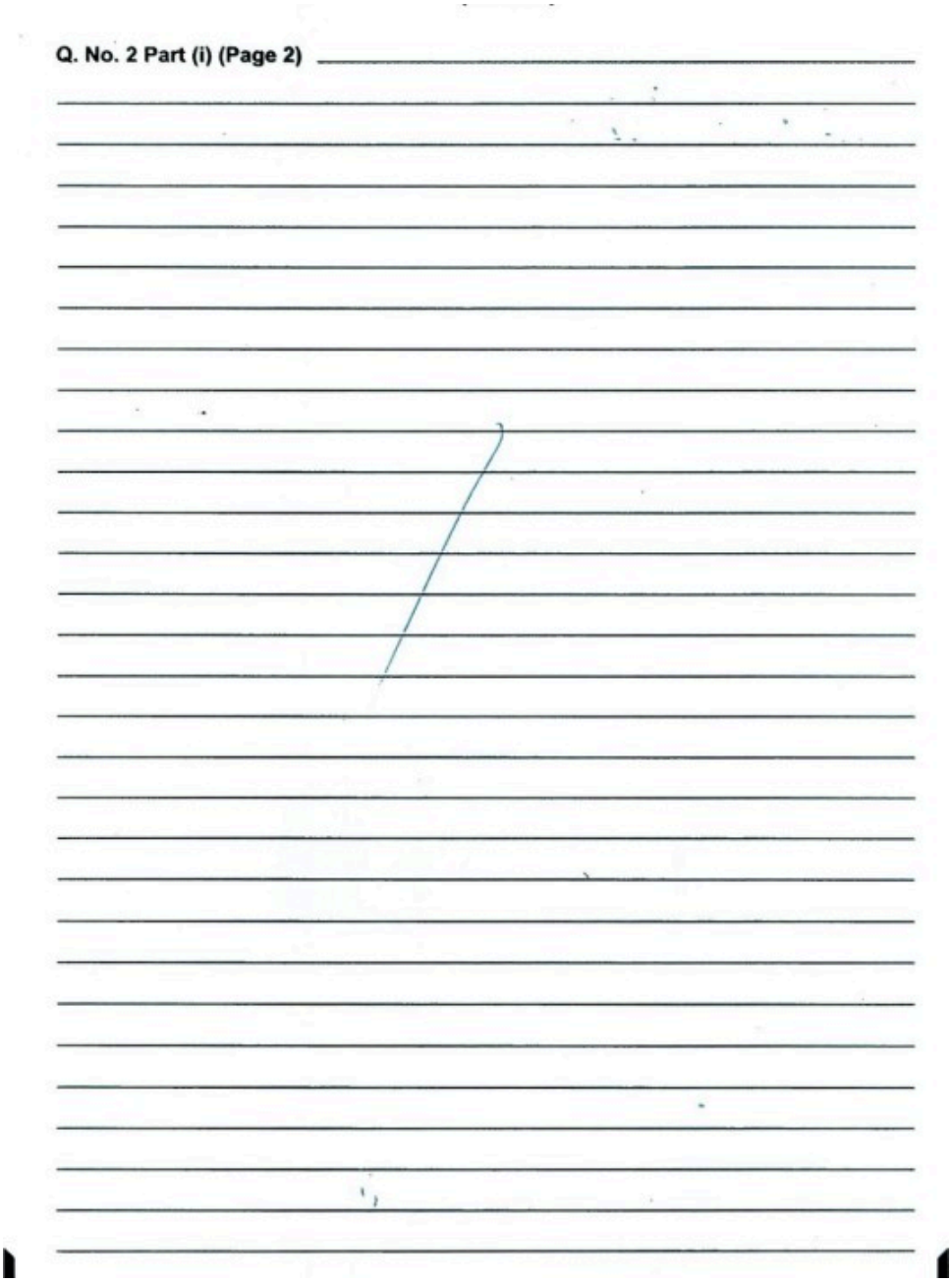
→ Replace y with x

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

⇒ Domain $f^{-1}(x) = R - \{+2\}$

⇒ Range $f^{-1}(x) = R - \{-1\}$

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



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

Solution:

$$y = e^{2x} \ln(x)$$

Diff w.r.t "x"

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

$\Rightarrow f = e^{2x}, \; g = \ln(x)$

$$\frac{d}{dx}(fg) = fg' + gf'$$

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

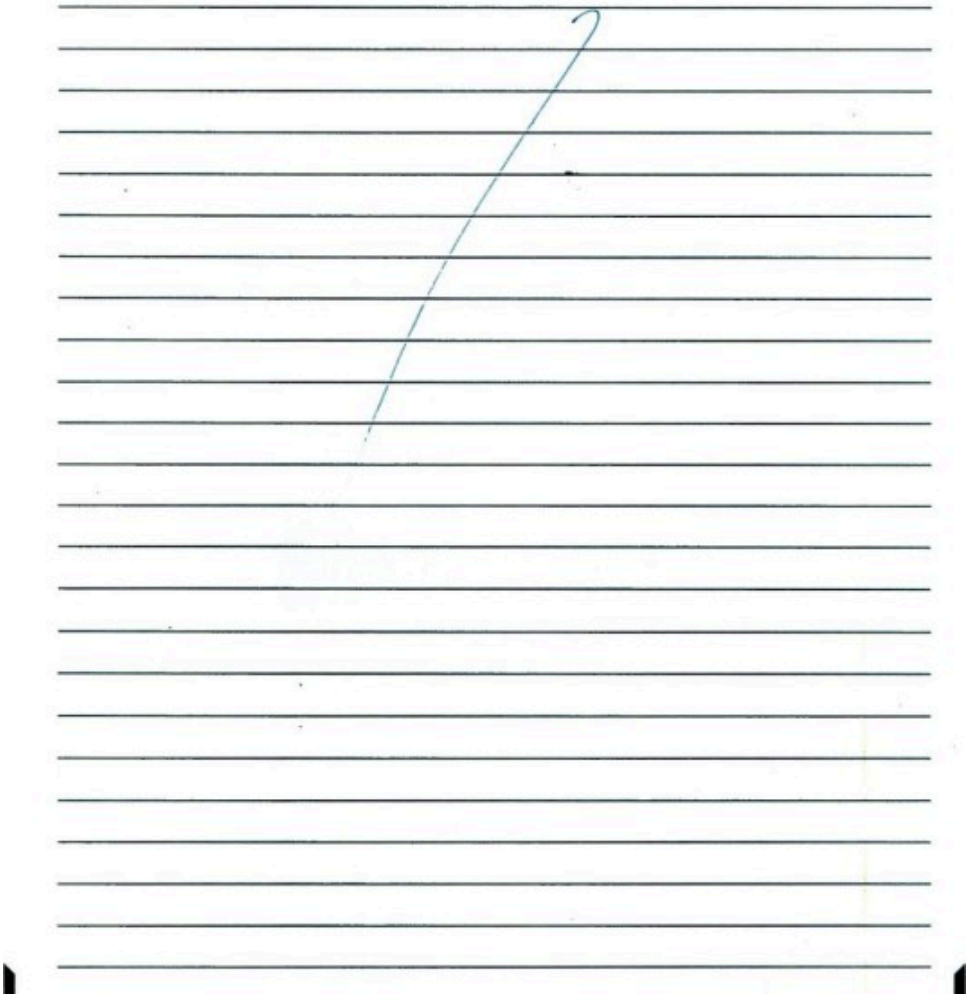
$$= e^{2x}\left(\frac{1}{x}\frac{d}{dx}(x)\right) + \ln(x)\, e^{2x}\frac{d}{dx}(2x)$$

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

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

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

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



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

Solution:

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

$$\Rightarrow \sin^2 x = \frac{1-\cos 2x}{2} \quad \& \int \cos 2x = \frac{\sin 2x}{2}$$

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

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

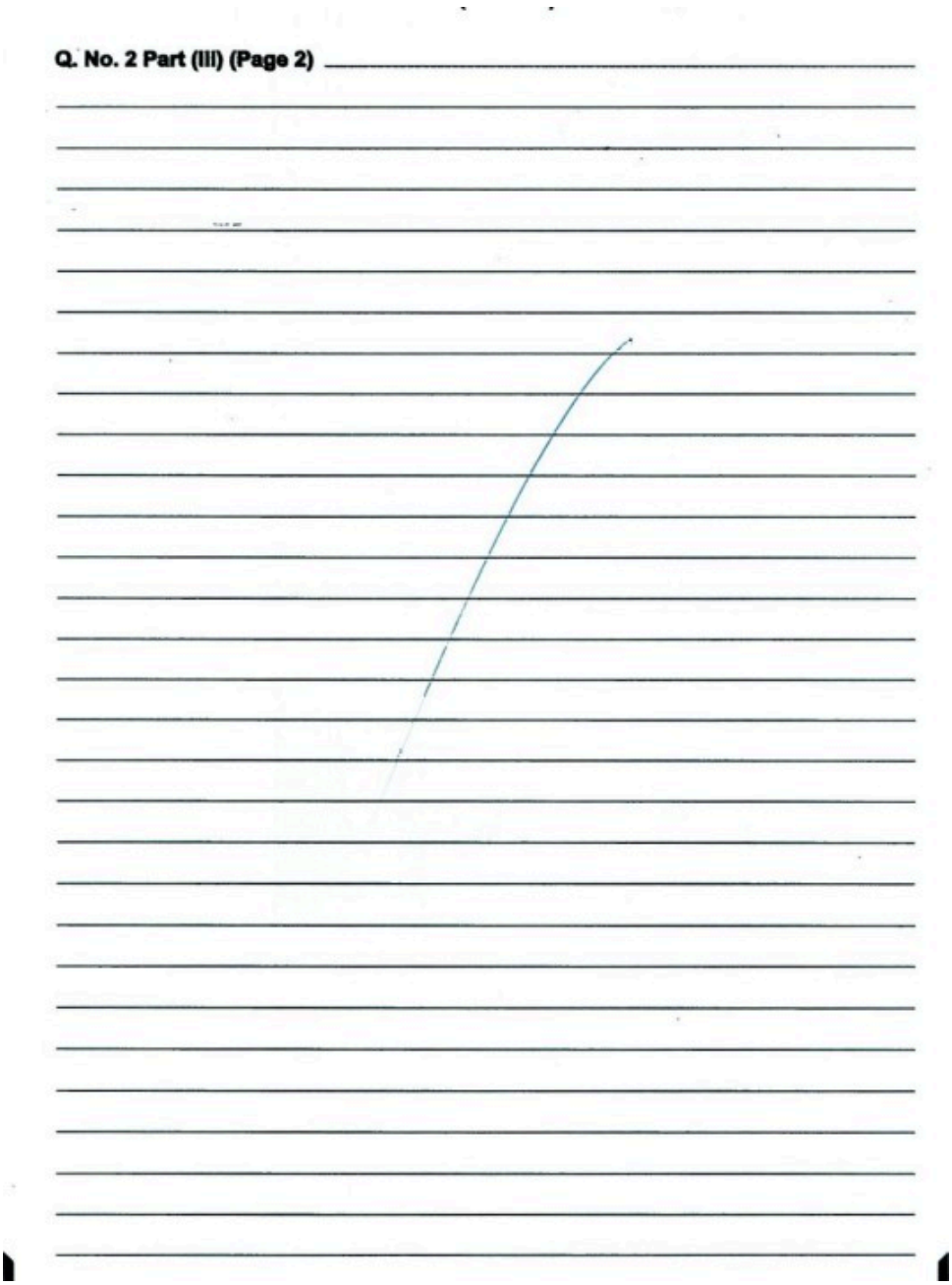
$$= \frac{1}{2}\left[\int 1 \, dx - \int \cos 2x \, dx\right]$$

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

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

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

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



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

Solution:

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

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

Integrate Both sides

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

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

$$\Rightarrow \int \frac{f'(x)}{f(x)} = \ln|f(x)| + C$$

$$\ln(y+1) = \ln[(x-2)(C)]$$

Apply exponential Both sides

$$e^{\ln(y+1)} = e^{\ln(x-2)(C)}$$

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

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

So,

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

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

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

Second part

$y = 2x + 1$

$y = mx + c$

$\Rightarrow m = 2, \quad c = 1$

$x^2 + y^2 = 5$

$r^2 = 5$

$r = \sqrt{5}$

$m^2 = 2^2 = 4$

$c^2 = 1^2 = 1$

$= r^2 (m^2 + 1)$

$= 5 (4 + 1)$

$= 5(5) = 25$

Since,

$c^2 < r^2 (m^2 + 1)$

$1 < 25$

So the line $y = 2x + 1$ miss the circle

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

Solution:

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

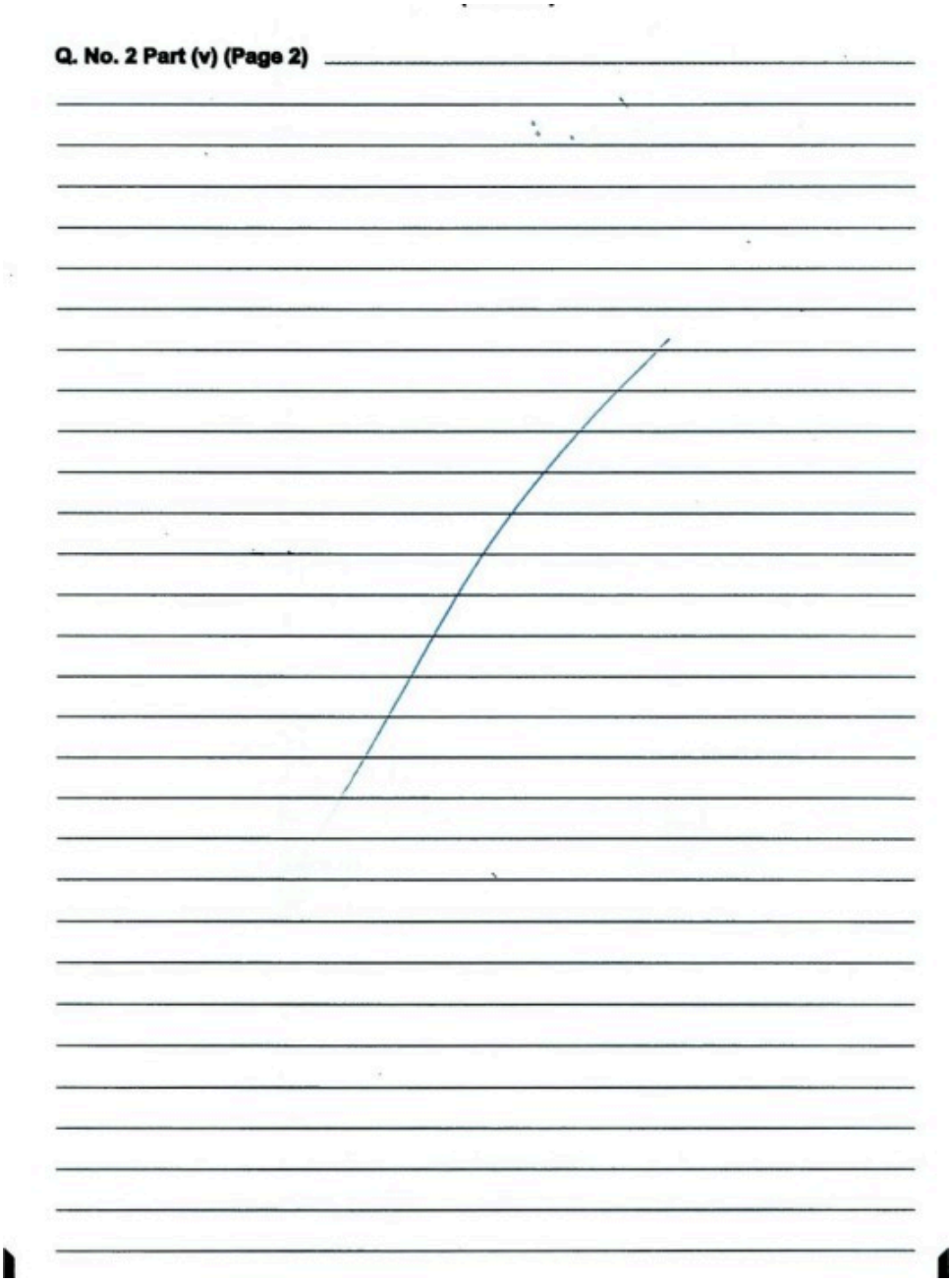
$x - y = 0$	$3x - 2y = 0$
$x = y$	$2y = 3x$
$y = x$ & $m = 1$	$y = \frac{3}{2}x$ & $m = \frac{3}{2}$
$y = \frac{-1}{m}x$	$y = \frac{-1}{m}x$
$y = \frac{-1}{1}x$	$y = \frac{-1}{3/2}x$
$y = -1x$	$y = \frac{-2}{3}x$
$y = -x$	$3y = -2x$
$(y+x) = 0$	$3y + 2x = 0$

Now,

$$(y+x)(3y+2x) = 0$$
$$3y^2 + 2xy + 3xy + 2x^2 = 0$$
$$3y^2 + 5xy + 2x^2 = 0 \rightarrow \text{Individual line eq}$$

$\Rightarrow$ $3x^2 + 5xy + 2y^2 = 0$ represent a pair of lines combine by (xy) terms.

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



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

Solution.

$$\gamma(t) = (t^2-2,\ 3t,\ \ln(t+1))$$

$$\gamma(t) = (t^2-2)\hat{i} + 3t\,\hat{j} + \ln(t+1)\,\hat{k}$$

Diff w.r.t "t"

$$\gamma'(t) = \frac{d}{dt}(t^2-1)\hat{i} + \frac{d}{dt}(3t)\hat{j} + \frac{d}{dt}\ln(t+1)\hat{k}$$

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

$$= 2t\,\hat{i} + 3\hat{j} + \frac{1}{t+1}\hat{k}$$

put $t = 2$

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

$$= 4\hat{i} + 3\hat{j} + \frac{1}{3}\hat{k}$$

$$\text{magnitude } (\gamma'(2)) = \sqrt{a^2\hat{i} + b^2\hat{j} + c^2\hat{k}}$$

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

$$= \sqrt{16 + 9 + 1/9}$$

$$= \frac{\sqrt{226}}{3}$$

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

⇒ **Second part**

$$2\cos x + 1 = 0$$

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

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

$$x = 60$$

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

sign is (-ve), so θ lies in Q II, III

In Q II

$$x = \frac{\pi}{2} + \frac{\pi}{3} \quad , \quad x = \pi - \frac{\pi}{3}$$

$$x = \frac{3\pi + 2\pi}{6} \quad , \quad x = \frac{3\pi - \pi}{3}$$

$$x = \frac{5\pi}{6} \quad , \quad x = \frac{2\pi}{3}$$

In Q III

$$x = \pi + \frac{\pi}{3} \quad , \quad x = \frac{3\pi}{2} - \frac{\pi}{3}$$

$$x = \frac{3\pi + \pi}{3} \quad , \quad x = \frac{9\pi - \pi}{6}$$

$$x = \frac{4\pi}{3} \quad , \quad x = \frac{8\pi}{6} = \frac{4\pi}{3}$$

$$S.S = \left\{\frac{5\pi}{6}, \frac{2\pi}{3}, \frac{4\pi}{3}\right\}$$

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

Solution,

$$y^2 = -12x \quad \text{---(1)}$$

$$\Rightarrow y^2 = -4ax \quad \text{---(2)}$$

compare eq (1) or (2)

$$-4a = -12$$

$$a = \frac{-12}{-4}$$

$$a = +3$$

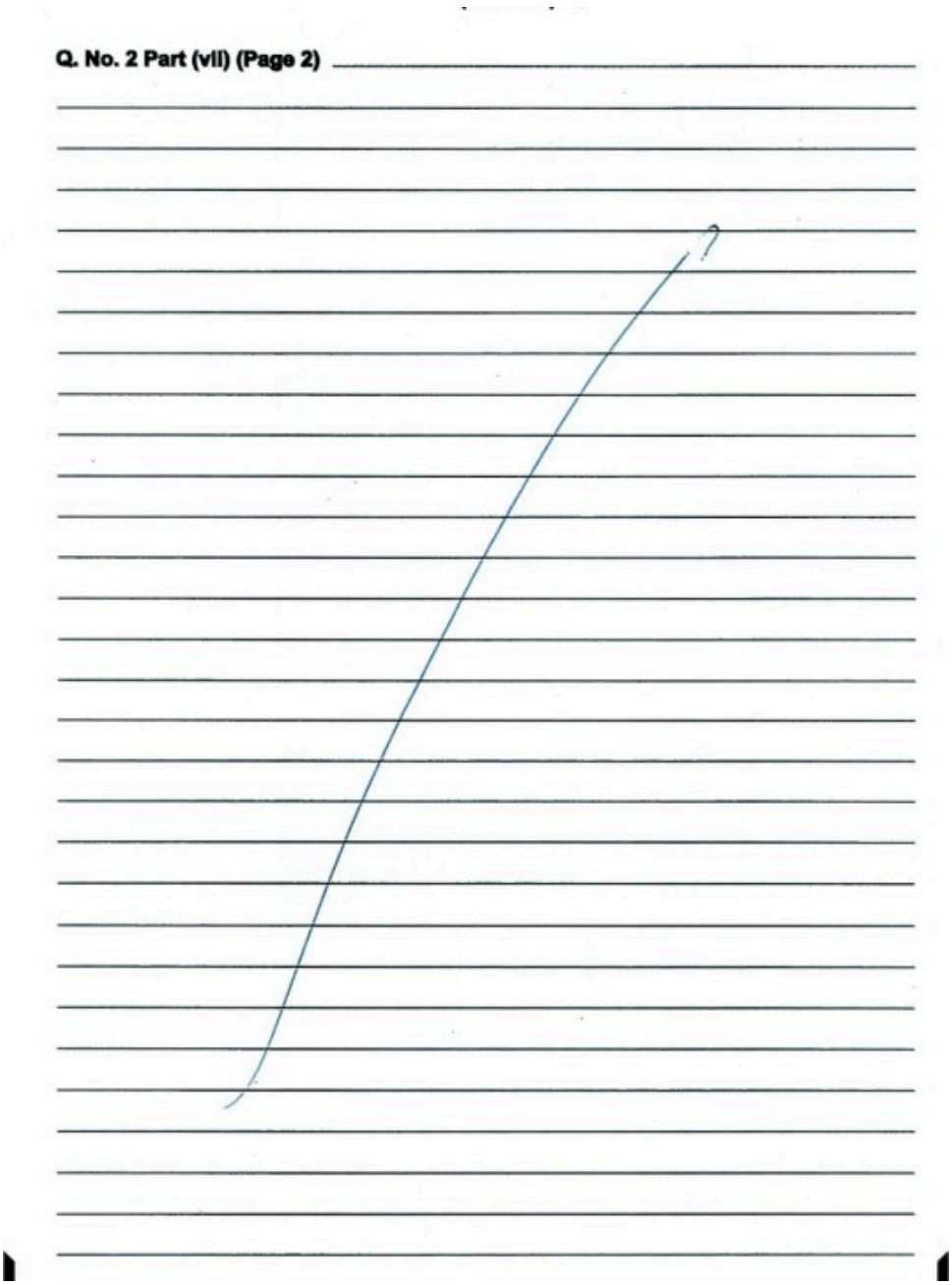
① vertex = (0,0) = (0,0)

② focus = (-a, 0)
= (-3, 0)

③ directrix $\Rightarrow$ $x = +a$
$x = 3$

④ length of L.R $\Rightarrow$ L.R = 4a
= 4(3)
= 12

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



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

Solution:

$f(x) = x^3 - 2x - 5$

$[2, 3] \rightarrow x_0 = 2, x_1 = 3$

$f(x_0) = f(2) = (2)^3 - 2(2) - 5 = 8 - 4 - 5$
$= -1$

$f(x_1) = f(3) = (3)^3 - 2(3) - 5 = 27 - 6 - 5$
$= 16$

$f(x_0) \cdot f(x_1) < 0$
$(-1)(16) < 0$
$-16 < 0$
$\Rightarrow$ Solution exist

1st Iteration.

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

$x_2 = 2.5$

$f(x_2) = f(2.5) = (2.5)^3 - 2(2.5) - 5$
$= 5.625$

$f(x_2) \cdot f(x_0) < 0$

2nd Iteration:

$x_3 = \frac{x_0 + x_2}{2} = \frac{2 \cdot 5 + 2}{2} = 2.25$

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

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

$= 1.890625$

$f(x_3) \cdot f(x_0) < 0$

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

Solution: $\Rightarrow \int_0^1 x e^x dx$

$$I = \int x e^x dx$$

Integration by parts.

$$\int uv\, dx = u\int v\, dx - \int\left(\int v\, dx \cdot \frac{d}{dx}u\right) dx$$

$$I = \int \underset{\downarrow}{x}\, \underset{\downarrow}{e^x}\, dx$$
$$u \quad v$$

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

$$= xe^x - \int (e^x \cdot (1))\, dx$$

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

$$= xe^x - e^x + C$$

Now apply limit

$$\int_0^1 xe^x dx = \left[xe^x - e^x\right]\Big|_0^1$$

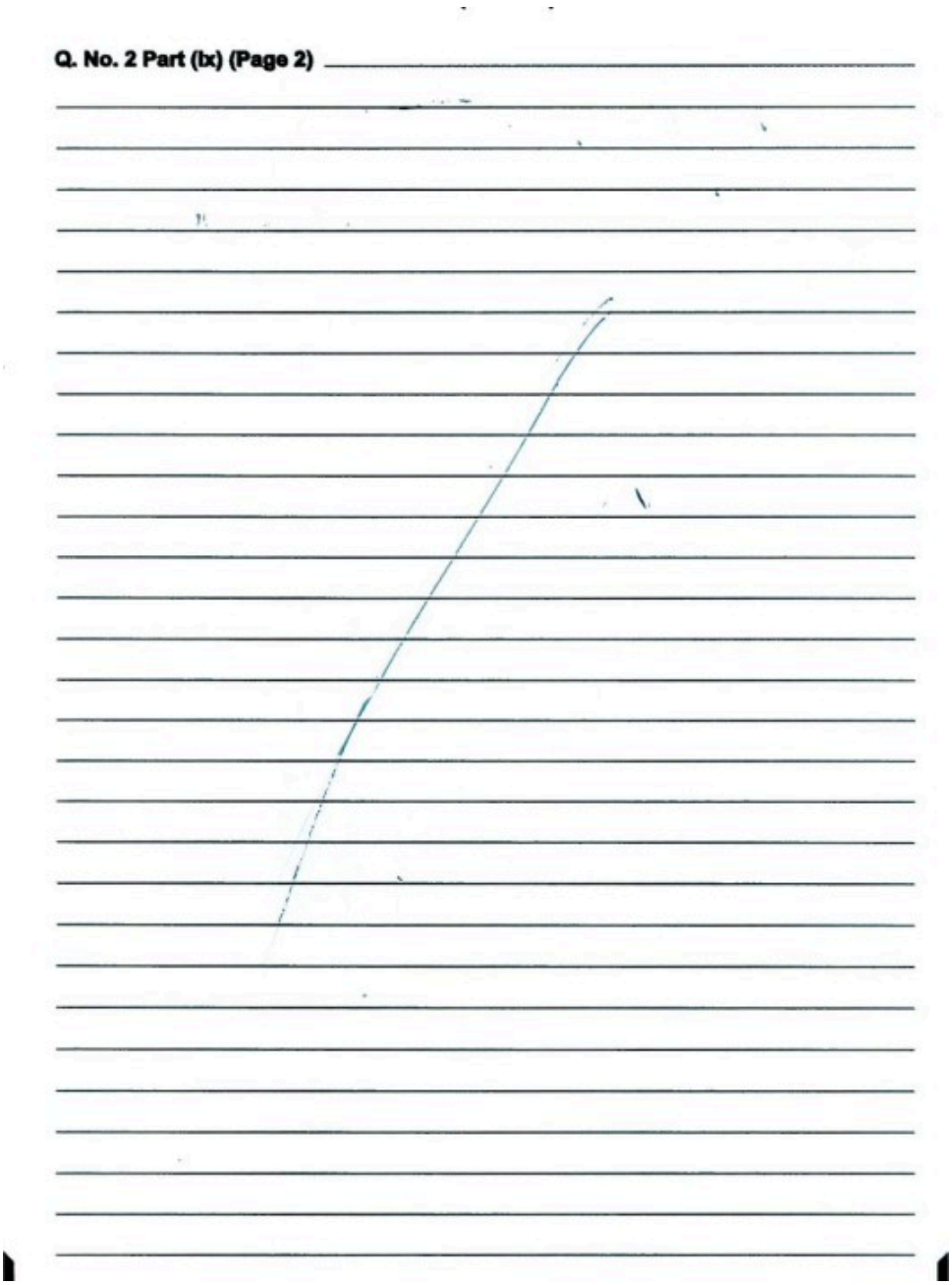
$$= e^x(x-1)\Big|_0^1$$

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

$$= 0 - 1(-1)$$

$$= 0 + 1 = 1$$

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



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

Solution,

$$y = x^2 + 2$$

$$x = 1, 3$$

$$A = \int_{x_1}^{x_2} f(x)\, dx$$

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

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

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

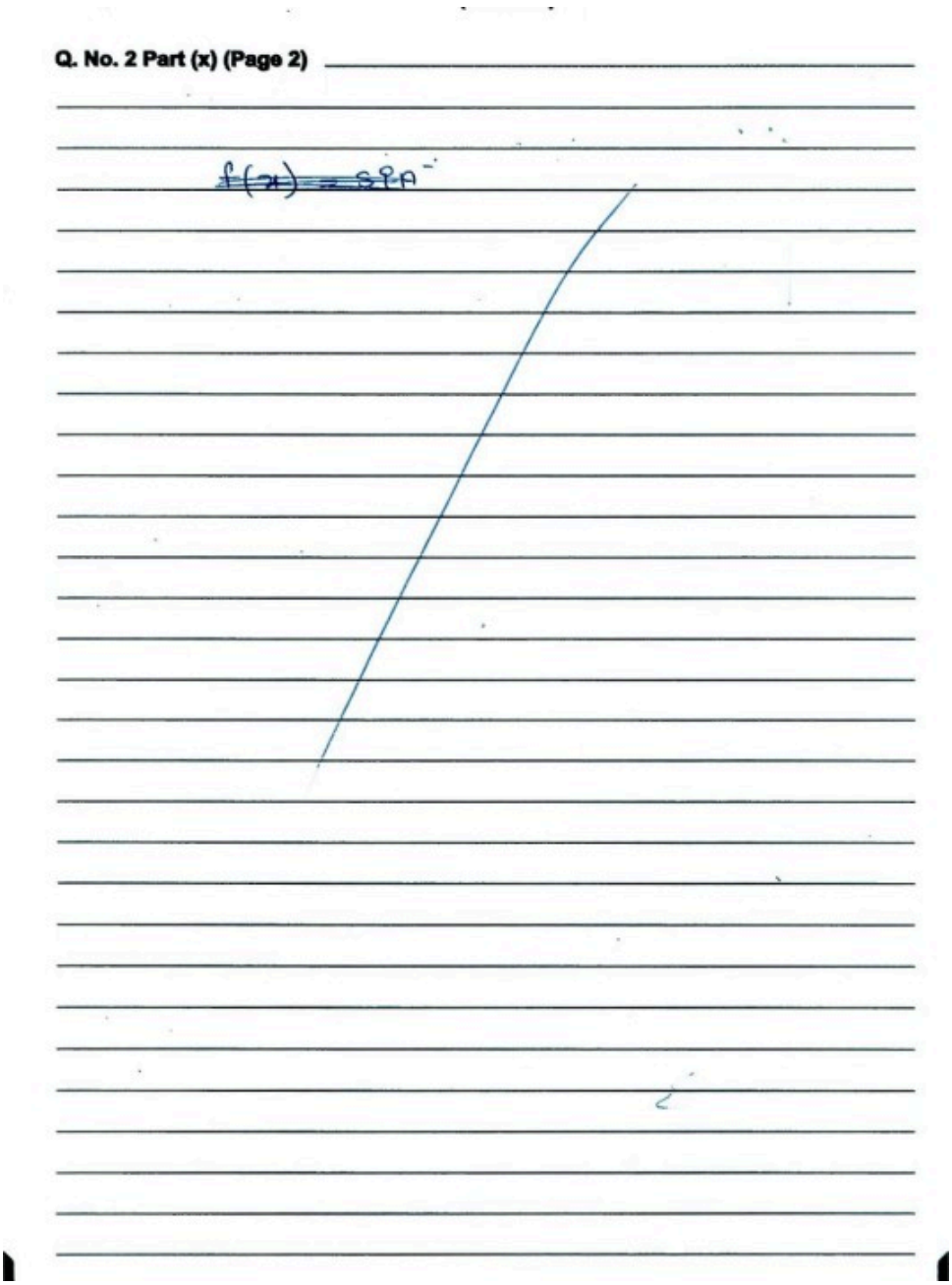
$$= \frac{(3)^3}{3} - \frac{(1)^3}{3} + 2(3) - 2(1)$$

$$= 9 - \frac{1}{3} + 6 - 2$$

$$= \frac{27 - 1 + 18 - 6}{3} = \frac{38}{3}$$

$$= \frac{38}{3}$$

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



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

Solutions

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

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

Diff. w.r.t "x"

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

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{gf' - fg'}{g^2} \quad \because f = x^2+1,\ g = x^2-1$$

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

$$= \frac{(x^2-1)(2x+0) - (x^2+1)(2x-0)}{(x^2-1)^2}$$

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

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

$$= \frac{2x(-2)}{(x^2-1)^2} = \frac{-4x}{(x^2-1)^2}$$

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

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

Solution:

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

let $f(x) = y$

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

So,

$y = \sqrt{x-1}$

Taking Sq. O.BS

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

$y^2 = x - 1$

$x = y^2 + 1$

So, $x = f^{-1}(y)$

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

Replace y with x

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

So,

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

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

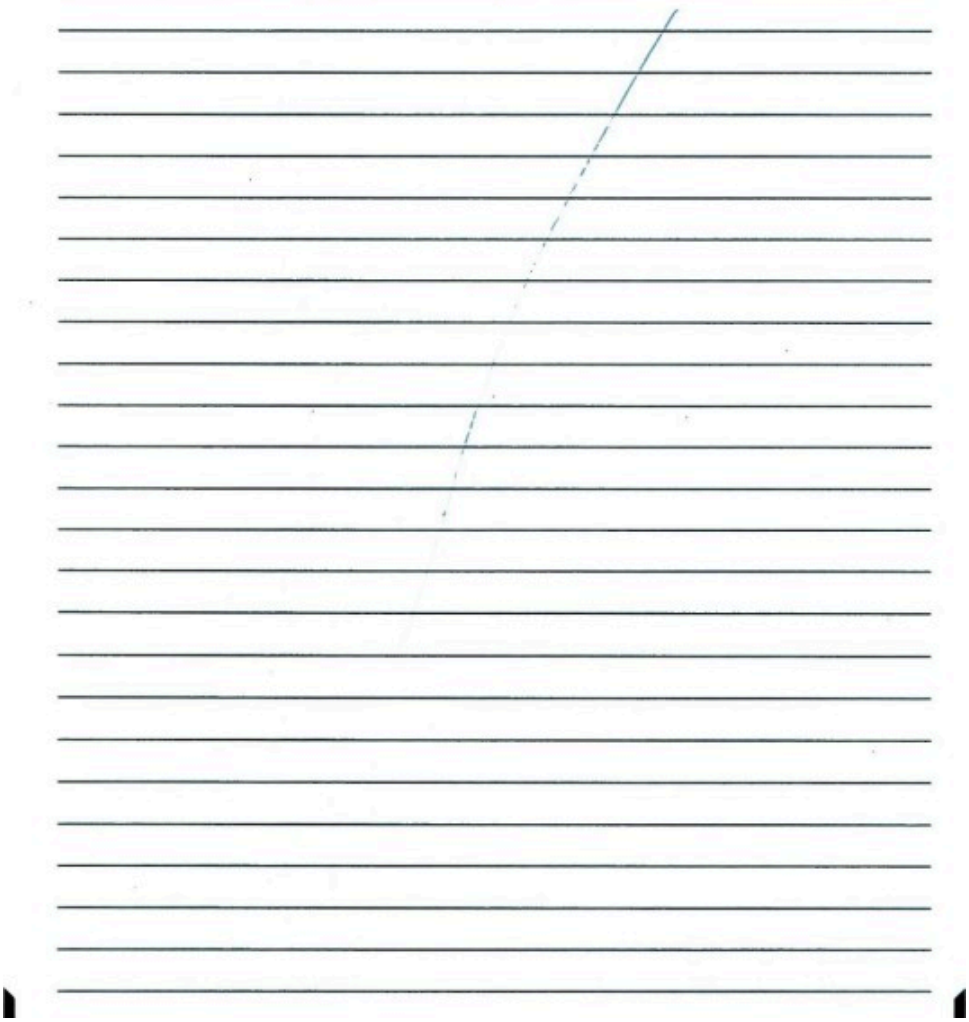
$\sqrt{(x^2+1)-1} = x$

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

$\sqrt{x^2} = x$

$x = x$ Proved!

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



(Section C)

Q. No. 3 (Page 1) **Solution:**

$A(0,0)$, $B(2,0)$, $C(0,2)$

(i)

$$x^2 + y^2 + 2gx + 2fy + c = 0 \quad \text{---(1)}$$

$A(\overset{x}{0},\overset{y}{0})$ → put in eq (1)

$$(0)^2 + (0)^2 + 2g(0) + 2f(0) + c = 0$$
$$0 + 0 + 0 + 0 + c = 0$$
$$c = 0 \quad \text{---(2)}$$

$A(\overset{x}{2},\overset{y}{0})$ → put in eq (1)

$$(2)^2 + (0)^2 + 2g(2) + 2f(0) + c = 0$$
$$4 + 0 + 4g + 0 + c = 0$$
$$4 + 4g + c = 0$$
$$\Rightarrow c = 0$$
$$4 + 4g + 0 = 0$$
$$4 + 4g = 0 \rightarrow 4(1 + g) = 0$$
$$1 + g = \frac{0}{4}$$
$$g = 0 - 1$$
$$g = -1$$

$C(\overset{x}{0},\overset{y}{2})$ → put in eq (1)

$$(0)^2 + (2)^2 + 2g(0) + 2f(2) + c = 0$$

Q. No. 3 (Page 2)

$0+4+0+4f+c=0$

$4+4f+c=0$

$4(1+f)+0=0 \quad \& \quad c=0$

$1+f=0$

$f=-1$

Now,

$x^2+y^2+2fy+2gx+c=0$

$x^2+y^2+2(-1)y+2(-1)x+0=0$

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

Required eq of circle

(PP)

Pt $(0,2)$

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

Diff w.r.t "x"

$2x+2y\frac{dy}{dx}-2-2\frac{dy}{dx}=0$

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

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

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

Q. No. 3 (Page 3)

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

Slope of tangent line at $(0,2)$

$$\left.\frac{dy}{dx}\right|_{(0,2)} = \frac{1-0}{2-1}$$

$$= \frac{1}{1} = 1$$

Slope of tangent $\rightarrow m_T = 1$

eq of tangent line pt $(0,2)$

$x_1 = 0, \; y_1 = 2$

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

$$y - 2 = 1(x - 0)$$

$$y - 2 = x$$

$$0 = x - y + 2$$

$$x - y + 2 = 0$$

(AAA)

eq of normal line at $(0,2)$

$$y - y_1 = \frac{-1}{m_T}(x - x_1)$$

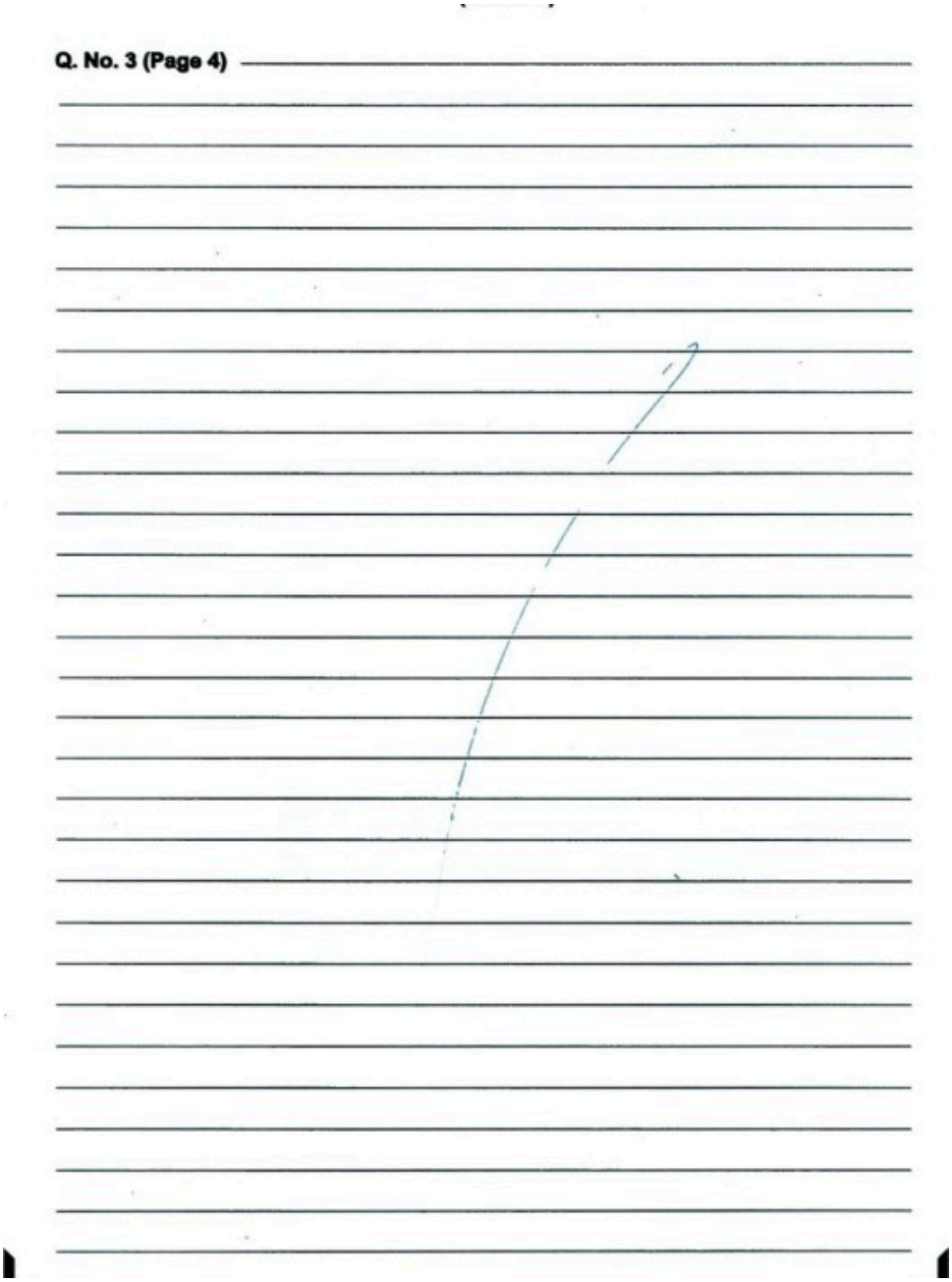
$$y - 2 = \frac{-1}{1}(x - 0)$$

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

$$y - 2 = -x$$

$$x + y - 2 = 0$$

Q. No. 3 (Page 4)



Q. No. 4 (Page 1)

Solution:

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

(a)

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

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

$$= 2\cos x - \sin 2x\,(2)$$

$$= 2\{\cos x - \sin 2x\}$$

$$f'(x) = 0$$

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

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

$$\cos x = \sin 2x \quad \& \quad \sin 2x = 2\sin x \cos x$$

$$2\sin x \cos x = \cos x$$

$$2\sin x = 0$$

$$\sin x = 0$$

$$x = \sin^{-1}(0)$$

$$x = n\pi$$

$$[0, \pi]$$

$$n = 0, 1$$

$$x = 0, \pi$$

(b)

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

Again diff w.r.t "x"

Q. No. 4 (Page 2)

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

$$= -2\left(+\sin x + 2\cos 2x\right)$$

$$f''(x) = 0$$

$$-2(\sin x + 2\cos 2x) = 0$$

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

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

$$2(1 - 2\sin^2 x) = -\sin x$$

$$2 - 4\sin^2 x + \sin x = 0$$

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

let $y = \sin x$

$y^2 = \sin^2 x$

$4y^2 - y - 2 = 0$ $\quad a = 4, b = -1, c = -2$

By Q.F

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{1 \pm \sqrt{(-1)^2 - 4(4)(-2)}}{2(4)} = \frac{1 \pm \sqrt{33}}{8}$$

$$y = \frac{1 \pm \sqrt{33}}{8}$$

$$\sin x = \frac{1 + \sqrt{33}}{8}, \quad \sin x = \frac{1 - \sqrt{33}}{8} = -0.59$$

$$= 0.84$$

Now,

$x = \sin^{-1}(0.84)$	$x = \sin^{-1}(0.59)$
$= 0.99$	$= -0.63$

Q. No. 4 (Page 3)

(b)

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

$\Rightarrow$ put $x = 0$

$f''(x) = -2(\sin 0 + 2\cos 2(0))$

$f''(0) = -2(0 + 2)$

$= -2(2) = -4 < 0$

local maximum

$x = \pi \rightarrow f''(x) = -2(\sin 180 + 2\cos 2(180))$

$f''(\pi) = -2(0 + 2(1))$

$= -2(2) = -4 < 0$

local maximum

(c)

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

$\Rightarrow$ put $x = 0$

$f'(x) = 2[\cos 0 - \sin 2(0)]$

$f'(0) = 2(1 - 0) = 2 >$ absolute min

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

$f'(\pi) = 2(-1 - 0)$

$= -2 < 0$ absolute max

Q. No. 4 (Page 4) Second part

$y = \sin^{-1}(x)$

$x = \sin y$ & $y \in [-2\pi, 2\pi]$

y	x
-360	-0.016
-300	0.017
-240	-0.01
-180	0.01
-120	-0.01
-60	0.005
0	0
60	-0.005
120	0.01
180	-0.01
240	0.01
300	-0.01
360	0.01

Domain $x = [-\infty, +\infty)$

Range $x = R$

end points $= (0.01, -0.01)$

Q. No. 5 (Page 1) Solution:

(a)

$$= \frac{x^2+3x+4}{(x^2+2x+5)(x-1)}$$

By partial fraction

$$\frac{x^2+3x+4}{(x-1)(x^2+2x+5)} = \frac{A}{x-1} + \frac{Bx+C}{(x^2+2x+5)} \quad \text{(1)}$$

$\Rightarrow$ Multiply $(x^2+2x+5)(x-1)$ O.B.S we get

$$x^2+3x+4 = A(x^2+2x+5)+(Bx+C)(x-1) \quad \text{(2)}$$

$\Rightarrow$ let $x-1=0$

$x=1$ (put in eq 2)

$$(1)^2+3(1)+4 = A((1)^2+2(1)+5)+(B(1)+C)(1-1)$$

$$1+3+4 = A(1+2+5)$$

$$8 = A(8)$$

$$A = \frac{8}{8}$$

$$A = 1$$

Q. No. 5 (Page 2)

from eq (2)

$$x^2 + 3x + 4 = Ax^2 + 2Ax + 5A + Bx^2 - Bx + Cx - C$$

$$x^2 + 3x + 4 = x^2(A+B) + x(2A + C - B) + (5A - B - C)$$

$\Rightarrow$ comparing coeff of "x^2"

$$1 = A + B$$

$$1 = 1 + B \quad \because A = 1$$

$$B = 1 - 1$$

$$B = 0$$

$\Rightarrow$ comparing coeff of "x"

$$3 = 2A + C - B$$

$$3 = 2(1) + C - 0 \quad \because A = 1, B = 0$$

$$3 - 2 = C$$

$$C = 1$$

So,

$$\frac{x^2+3x+4}{(x-1)(x^2+2x+5)} = \frac{A}{x-1} + \frac{Bx+C}{x^2+2x+5}$$

$$= \frac{1}{x-1} + \frac{0(x)+01}{x^2+2x+5}$$

$$= \frac{1}{x-1} + \frac{1}{x^2+2x+5} \quad \text{---(3)}$$

(b)

Integrate Both side of eq (3)

$$\int \frac{x^2+3x+4}{(x-1)(x^2+2x+5)}\,dx = \int \frac{1}{x-1}\,dx + \int \frac{1}{x^2+2x+5}\,dx$$

Q. No. 5 (Page 3)

$$\int \frac{x^2+3x+4}{(x-1)(x^2+2x+5)}\,dx = \ln|x-1| + \int \frac{1}{(x^2+2x+1)+5-1}\,dx$$

$$= \ln|x-1| + \int \frac{1}{(x+1)^2+(4)}\,dx$$

$$= \ln|x-1| + \int \frac{1}{(x+1)^2+(2)^2}\,dx$$

$$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)+c$$

$$\int \frac{x^2+3x+4}{(x-1)(x^2+2x+5)} = \ln|x-1| + \frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)+c$$

1st Que ⇒ Part (2)

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

$x_1 = 0$, $y_1 = 0$, $x_2 = 4$, $y_2 = 0$,

$x_3 = 0$, $y_3 = 6$

Medpan =

$\left(\frac{y_3+y_2-y_1}{2}\right)$	$-\left(\frac{x_3+x_2-x_1}{2}\right)$	$-\left(\frac{y_3+y_2-y_1}{2}\right)x_1+\left(\frac{x_3+x_2}{2}-x_1\right)$
$\left(\frac{y_1+y_3-y_2}{2}\right)$	$-\left(\frac{x_1+x_3-x_2}{2}\right)$	$-\left(\frac{y_1+y_3-y_2}{2}\right)x_2+\left(\frac{x_1+x_3}{2}-x\right.$
$\left(\frac{y_2+y_1-y_3}{2}\right)$	$-\left(\frac{x_2+x_1-x_3}{2}\right)$	$-\left(\frac{y_2+y_1-y_3}{2}\right)x_3+\left(\frac{x_2+x_1}{2}-x_3\right.$

Q. No. 5 (Page 4)

$$= \begin{vmatrix} \left(\frac{6+0}{2}-0\right) & -\left(\frac{0+4}{2}-0\right) & -\left(\frac{6+0}{2}-0\right)0+\left(\frac{0+4}{2}-0\right)0 \\ \left(\frac{0+6}{2}-0\right) & -\left(\frac{0+0}{2}-4\right) & -\left(\frac{0+6}{2}-0\right)4+\left(\frac{0+0}{2}-4\right)0 \\ \left(\frac{0+0}{2}-6\right) & -\left(\frac{4+0}{2}-0\right) & -\left(\frac{0+0}{2}-6\right)0+\left(\frac{4+0}{2}-0\right)6 \end{vmatrix}$$

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

$$= \begin{vmatrix} 3 & -2 & 0 \\ 3 & 4 & -12 \\ -6 & -2 & 12 \end{vmatrix} \quad \because R' + (R_2 + R_3)$$

$$= \begin{vmatrix} 0 & 0 & 0 \\ 3 & 4 & -12 \\ -6 & -2 & 12 \end{vmatrix} \Rightarrow \text{Hence median are concurrent}$$

from R_1

$3x - 2y + 0 = 0 \rightarrow 3x - 2y = 0$ — (1)

from R_2

$3x + 4y - 12 = 0$ — (2)

from R_3

$-6x - 2y + 12 = 0 \rightarrow +3x + y - 6 = 0$ — (3)

Sub eq (3) from (2)

$3x + 4y - 12 = 0$

$\pm 3x \pm y \mp 6 = 0$

$3y - 6 = 0$

$3y - 6 = 0$

$y = \frac{6}{3} = 2$

put $y = 2$ in (1)

$3x - 2(2) = 0 \rightarrow 3x = 4$

$x = 4/3$

$\Rightarrow (\frac{4}{3}, 2)$

(x, y)

Q. No. 6 (Page 1)

Solution:

$$\frac{dy}{dx} = \frac{x^2+y^2}{xy} \quad \text{---(i)}$$

let

$$y = vx$$

$\Rightarrow$ * Diff w.r.t "x" *

$$\frac{dy}{dx} = v\frac{d}{dx}(x) + x\frac{d}{dx}(v)$$

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

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

put $\frac{dy}{dx} = v + x\frac{dv}{dx}$ in eq (i)

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

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

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

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

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

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

Q. No. 6 (Page 2)

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

Integrate Both sides

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

$$\frac{v^{1+1}}{1+1} = \ln|x| + C$$

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

$$v^2 = 2\ln|x| + 2C$$

$$v^2 = 2\ln|x| + C \quad \because 2C = C$$

put

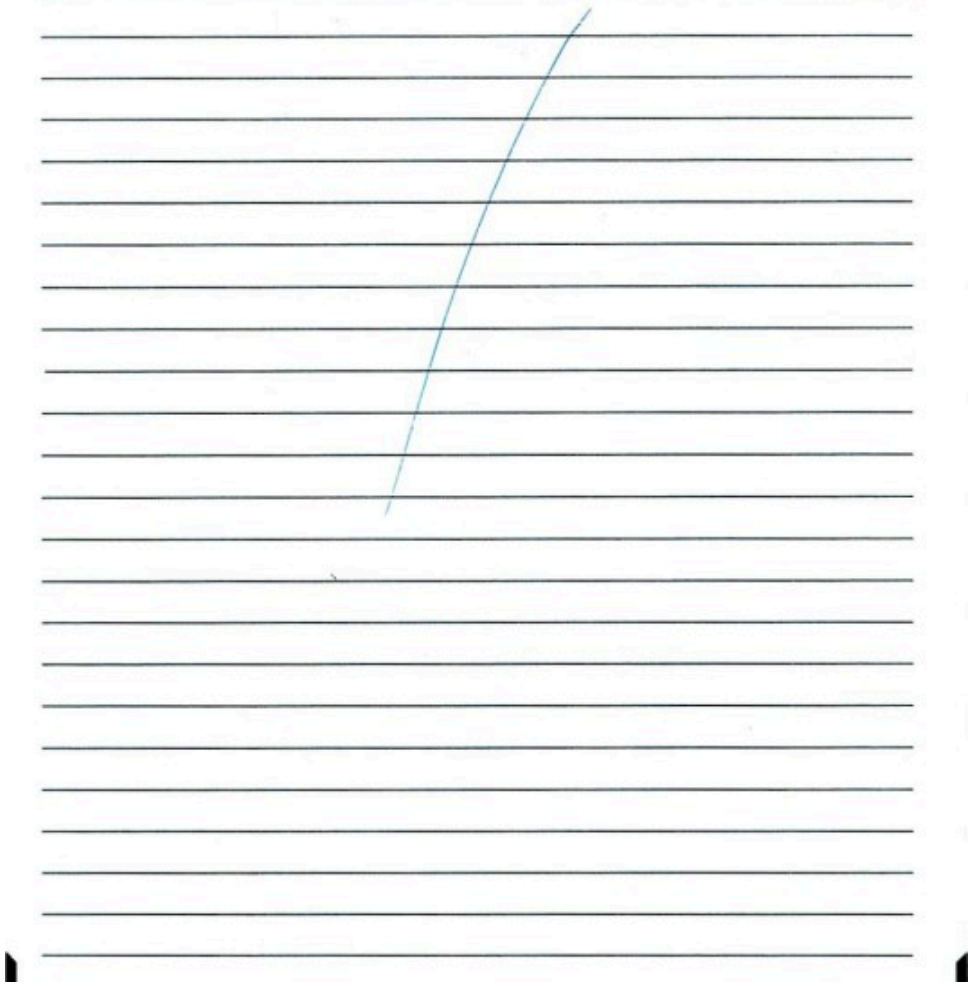
$$v = \frac{y}{x}$$

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

General solution

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

Q. No. 6 (Page 3)



Q. No. 6 (Page 4)

