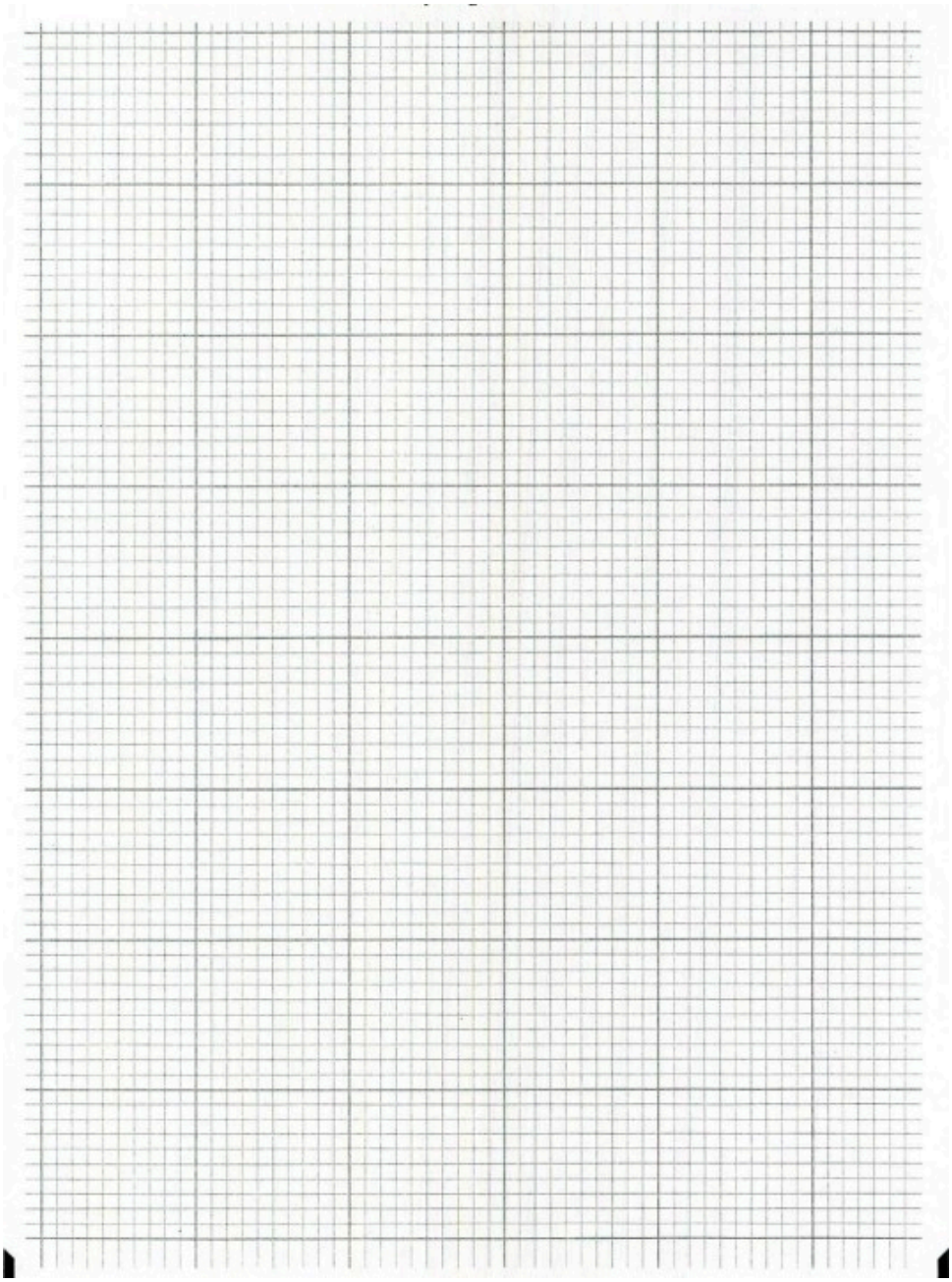
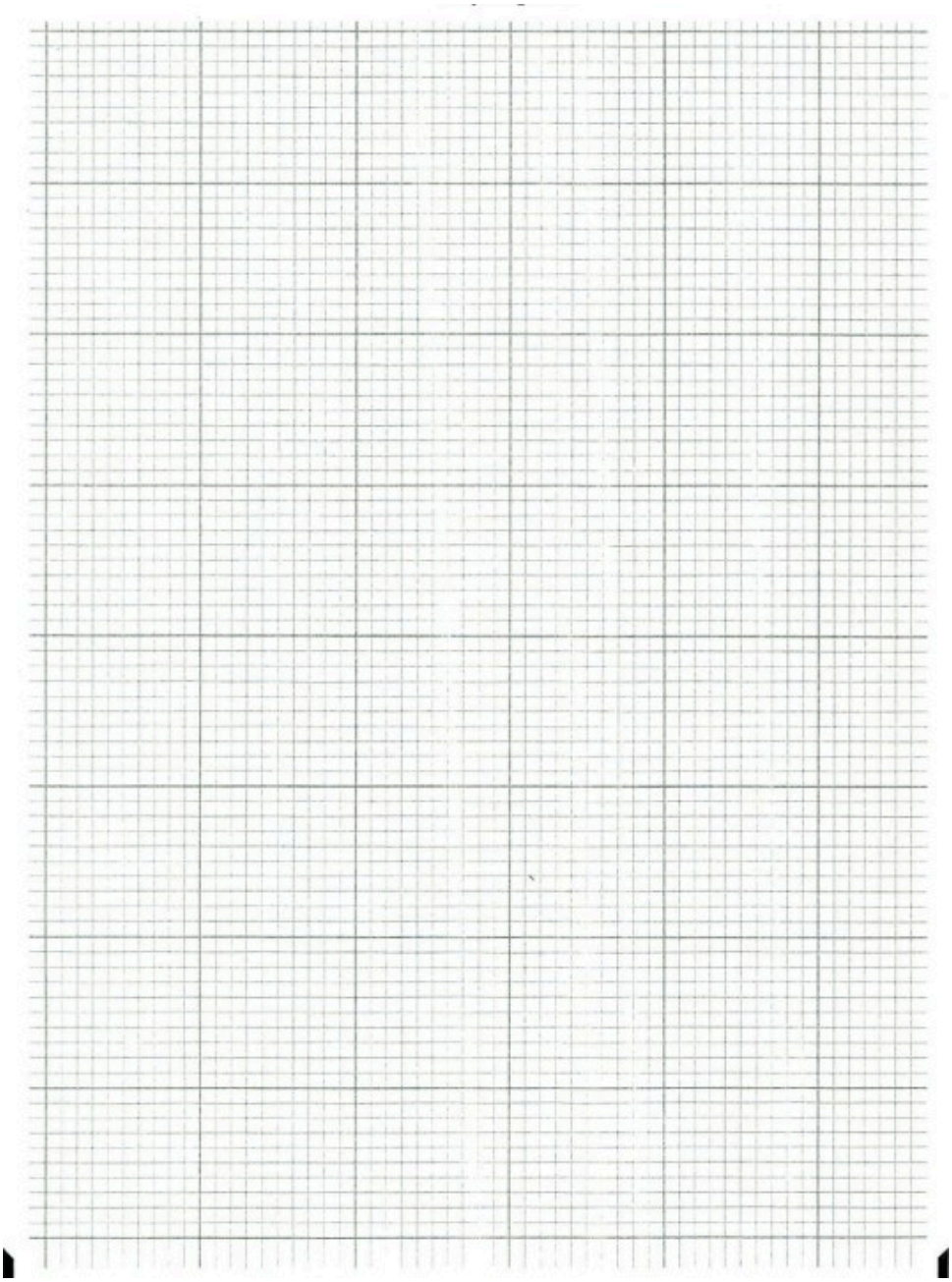
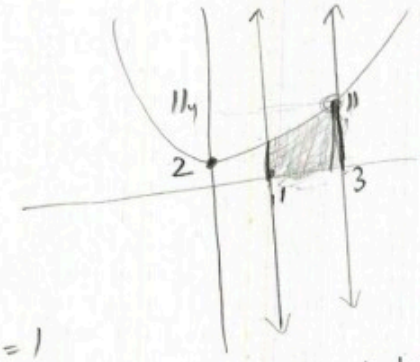






$y = x - 1$

$y = 1 - 1$

$y = 0$

$x^2 + 2$

$0 = x^2 +$

$x^2 = -2$

$x = \sqrt{-2}$

$y = 2$

$x = 1$

$y = (1)^2 + 2$

$y = 3 \quad (1, 3)$

$\frac{1}{2} |2+4| + |2 \times 4|$

$y = x^2 + 2$

$x = \sqrt{y-2}$

$x = 3$

$y = 3^2 + 2$

$y = 9 + 2 \Rightarrow 11$

$(3, 11)$

$2+11$

13

$\frac{1}{2} |11 3| + |2$

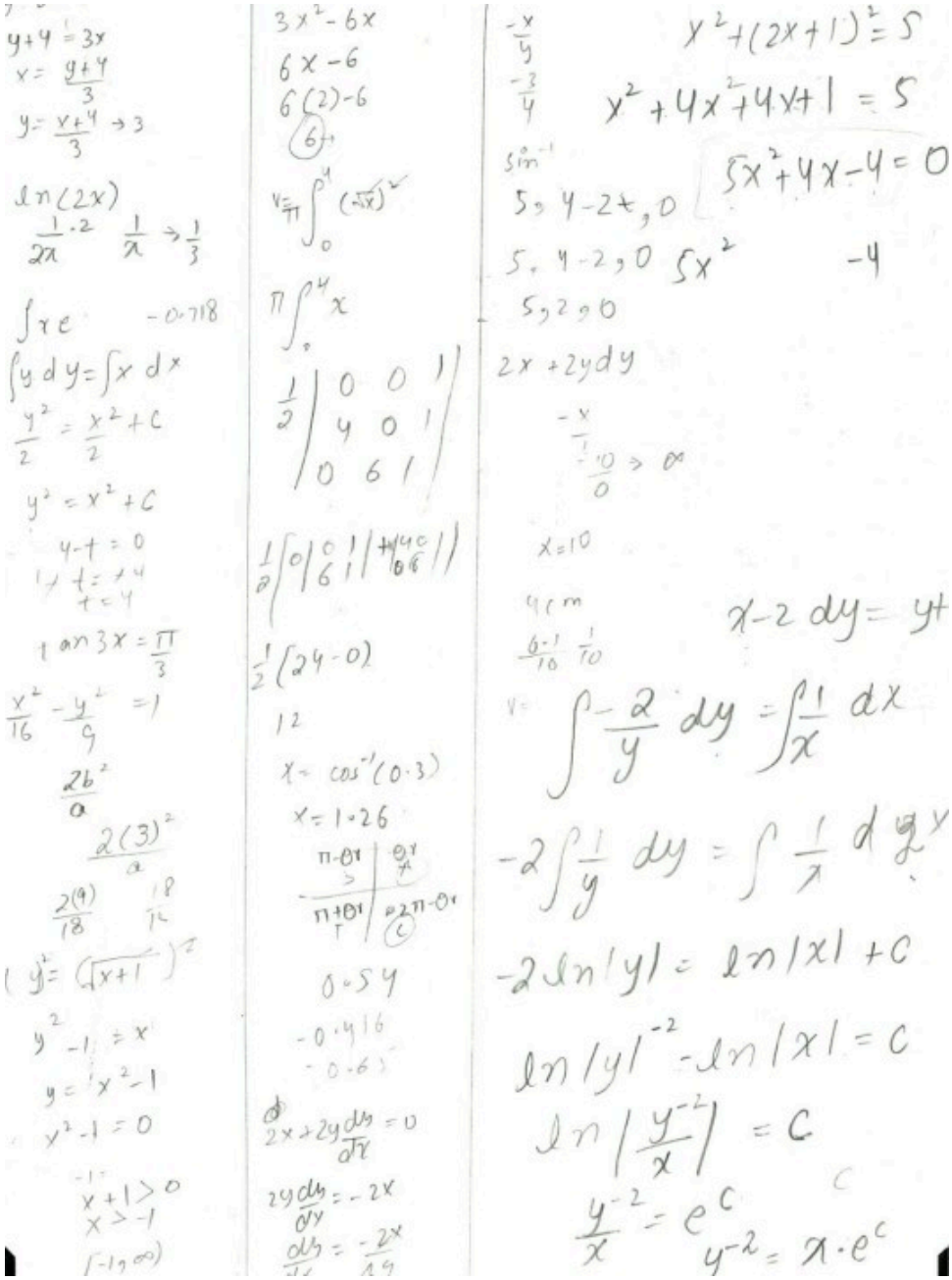
$\frac{1}{2} \begin{vmatrix} 1 & 3 \\ 3 & 11 \\ 0 & 0 \end{vmatrix}$

$\frac{1}{2} \{ |11 \ 1| - 3|3 \ 1| + 0|3 \ 11| \}$

$\frac{1}{2}(11) - 3(3)$

$\frac{1}{2}(11 - 9)$

$\frac{1}{2}$



$y+4 = 3x$

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

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

$\ln(2x)$

$\frac{1}{2x} \cdot 2 \quad \frac{1}{x} \to \frac{1}{3}$

$\int xe \quad -0.718$

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

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

$y^2 = x^2 + C$

$4 - 1 = 0$

$1 + t = x + 4$

$t = 4$

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

$\frac{x^2}{16} - \frac{y^2}{9} = 1$

$\frac{2b^2}{a}$

$\frac{2(3)^2}{a}$

$\frac{2(9)}{18} \quad \frac{18}{1c}$

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

$y^2 - 1 = x$

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

$x^2 - 1 = 0$

$x + 1 > 0$

$x > -1$

$(-1, \infty)$

$3x^2 - 6x$

$6x - 6$

$6(2) - 6$

6

$V = \pi \int_0^4 (\sqrt{x})^2$

$\pi \int_0^4 x$

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

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

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

12

$x = \cos^{-1}(0.3)$

$x = 1.26$

$\pi - \theta x \quad \theta x$

$\pi + \theta x \quad 2\pi - \theta x$

0.54

-0.416

-0.6

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

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

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

$-\frac{x}{y} \quad -\frac{3}{4}$

$\sin^{-1}$

$5, 4 - 2t, 0$

$5, 4 - 2, 0$

$5, 2, 0$

$y^2 + (2x+1)^2 = 5$

$y^2 + 4x^2 + 4x + 1 = 5$

$5x^2 + 4x - 4 = 0$

$5x^2 \qquad -4$

$2x + 2y\,dy$

$-x$

$\frac{-10}{0} > \infty$

$x = 10$

$4cm$

$\frac{6-1}{10} \quad \frac{1}{10}$

$x - 2\,dy = yt$

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

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

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

$\ln|y|^{-2} - \ln|x| = C$

$\ln\left|\frac{y^{-2}}{x}\right| = C$

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

$y^{-2} = x \cdot e^C$

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

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

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

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

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

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

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

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

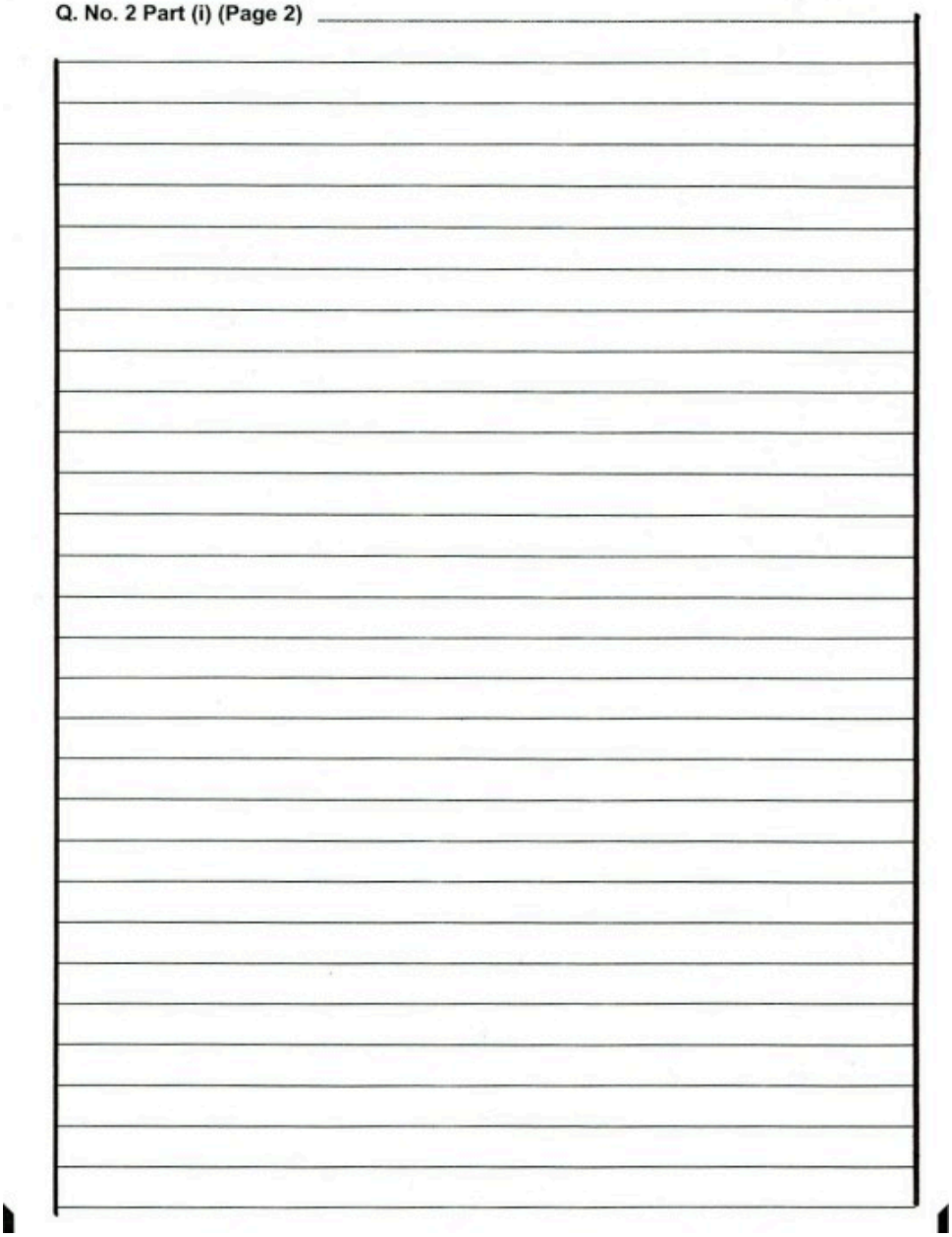
$$y = \frac{-x-3}{x-2}$$

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

Domain $f^{-1}(x) = \mathbb{R} - \{2\}$

Range $f^{-1}(x) = \mathbb{R} - \{-1\}$

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



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

$$\frac{dy}{dx} = ?$$

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

$$\frac{dy}{dx} = 2e^{2x}\ln(x) + \frac{1}{x}e^{2x}$$

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

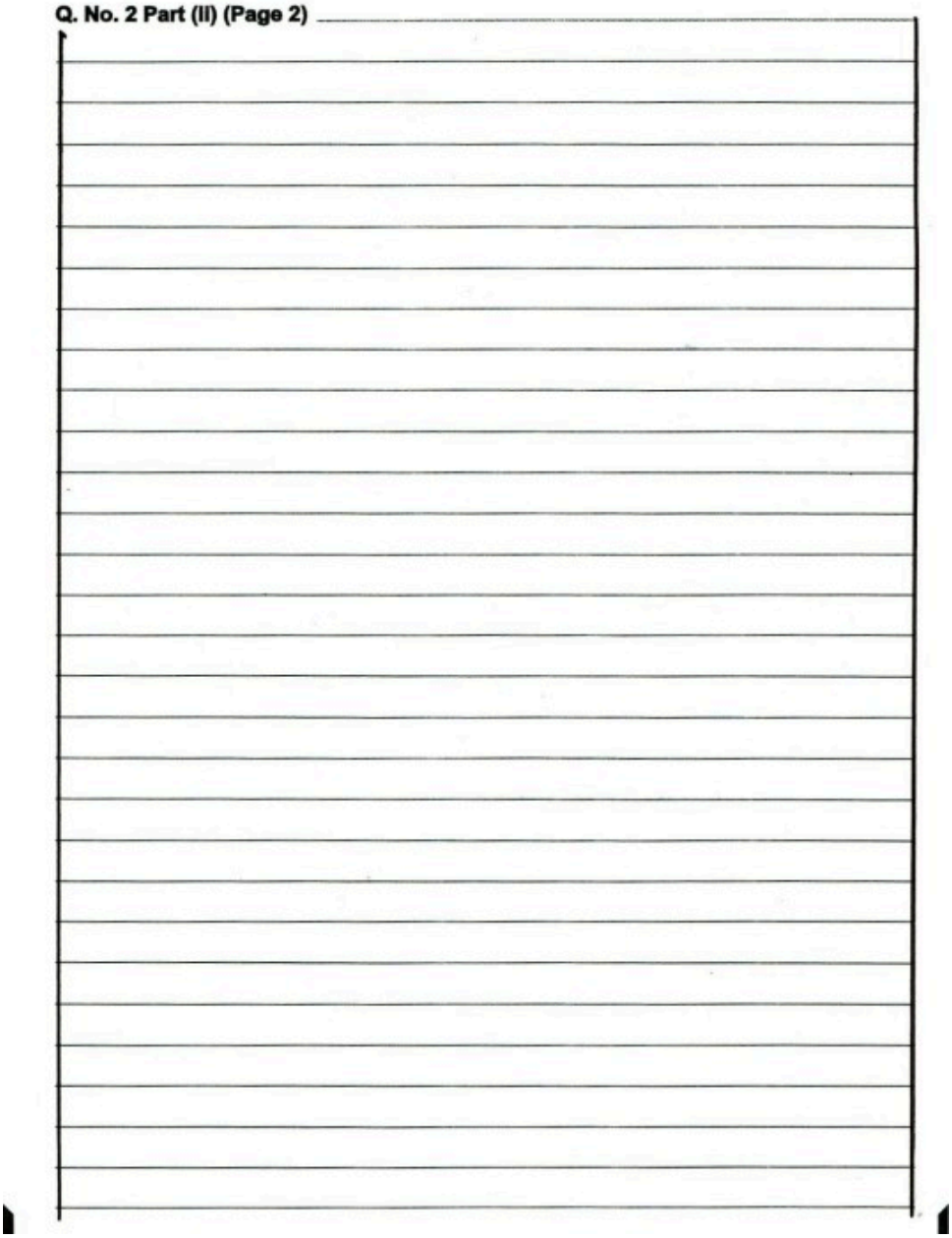
As product rule for derivative is

$$\frac{d}{dx}\{p \cdot v\} = \frac{dp}{dx} \cdot v + \frac{dv}{dx} \cdot p$$

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

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

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



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

$$\int \sin^2 x \, dx \qquad \therefore \sin^2 x = \frac{1-\cos 2x}{2}$$

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

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

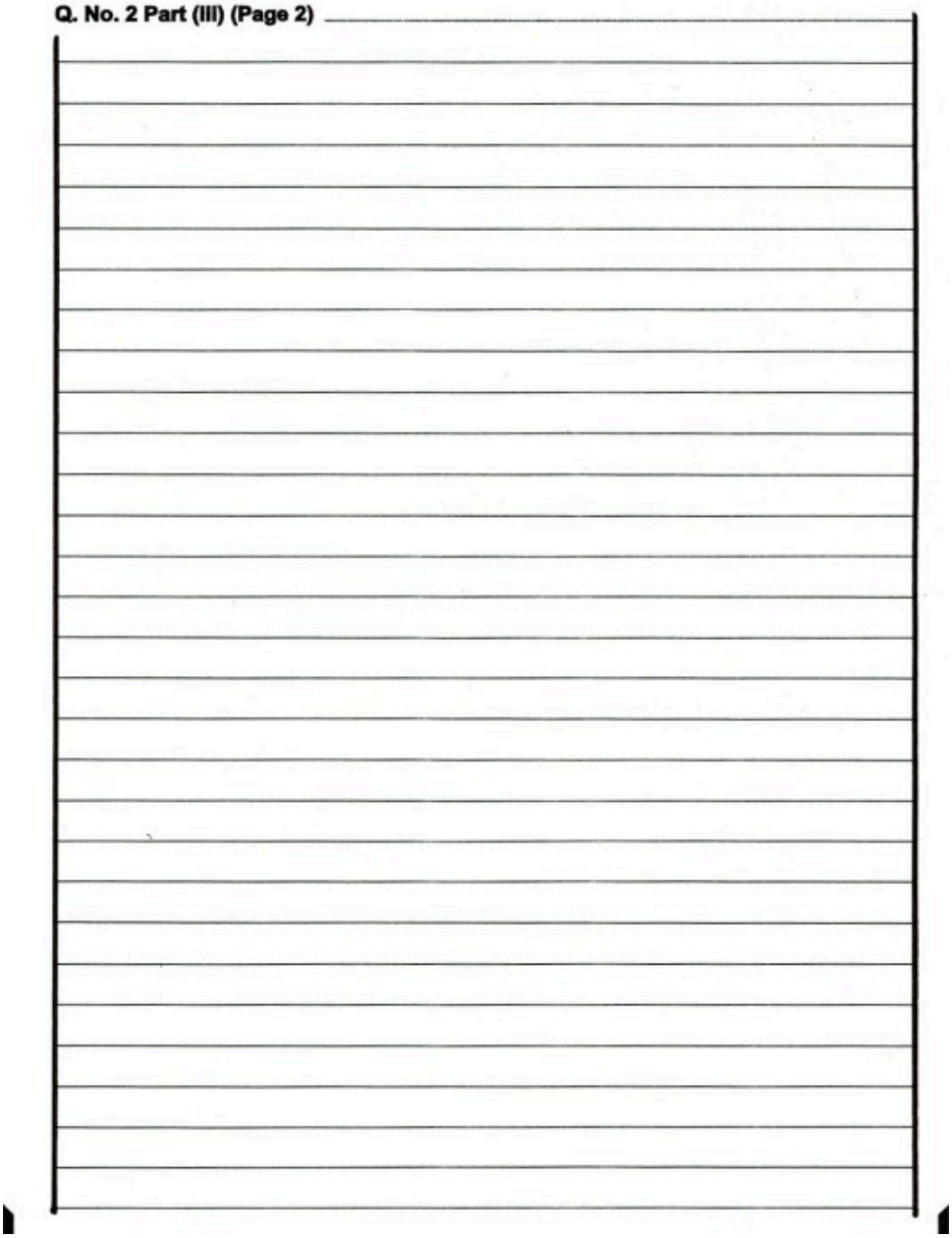
$$= \frac{1}{2}\int 1 \, dx - \frac{1}{2}\int \cos 2x \, dx$$

$$= \frac{1}{2}x - \frac{1}{4}\int \cos 2x \cdot 2 \, dx$$

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

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

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



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

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

$$(x-2)\,dy = (y+1)\,dx$$

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

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

By integrating bothsides

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

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

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

$$\ln|y|^{-2} = \ln|x| = c$$

$$\ln\left|\frac{y^{-2}}{x}\right| = c$$

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

$$y^{-2} = x e^c \qquad \therefore e^c = c$$

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

$$\frac{+1}{y^2} = xC$$

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

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

(A)

If it passes through origin then, $(0,0)$

$3(0)^2 - 5(0)(0) + 2(0)^2 = 0$

$0 - 0 + 0 = 0$

$0 = 0$

Th is shows that the line pass through origin.

(B)

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

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

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

$\boxed{x-y=0}$, $\boxed{3x-2y=0}$

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

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

$f(t) =$

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

$$2\cos x = -1$$

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

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

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

Now, As cos is negative in 2nd and 3rd quadrant,

II Quadrant,

$$x = \pi - \theta_r$$

$$x = \pi - \frac{\pi}{3} \Rightarrow \frac{2\pi}{3}$$

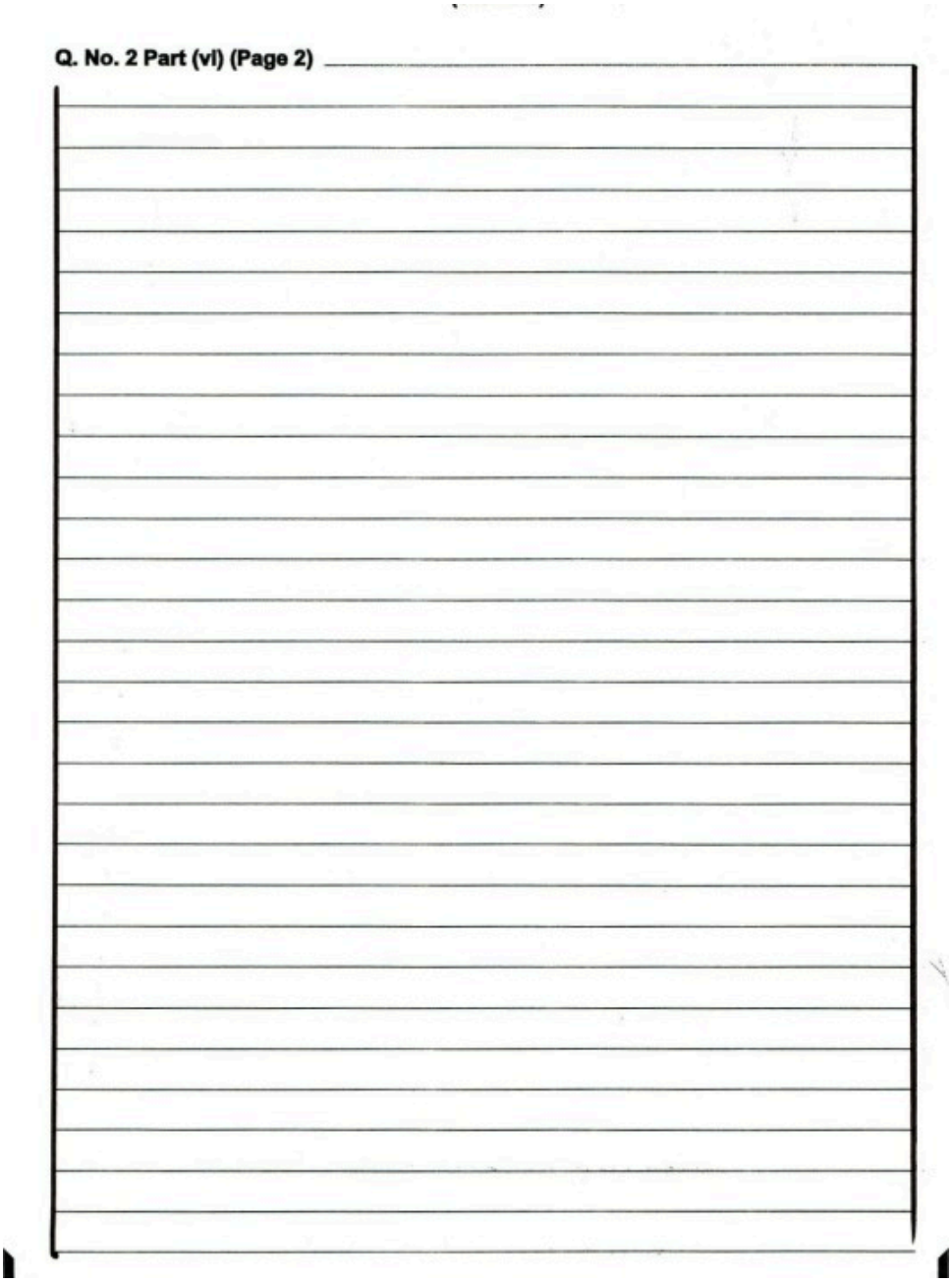
III Quadrant,

$$x = \pi + \theta_r$$

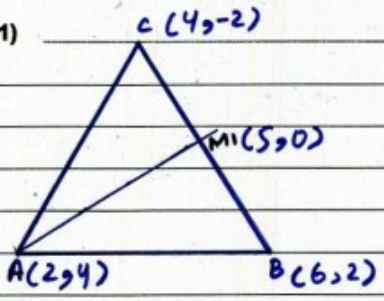
$$= \frac{4\pi}{3}$$

Thus Solution Set $\left\{\frac{2\pi}{3}, \frac{4\pi}{3}\right\}$

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



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



❖ Median ❖

Midpoint of BC $= \left(\frac{6+4}{2}, \frac{2-2}{2}\right)$

$= \left(\frac{10}{2}, \frac{0}{2}\right)$

$= (5, 0)$

By two point slope formula:

$$\left(\frac{x-2}{5-2}\right) = \left(\frac{y-4}{0-4}\right)$$

$$\frac{x-2}{3} = \frac{y-4}{-4}$$

$$-4(x-2) = 3(y-4)$$

$$-4x+8 = 3y-12$$

$$3y+4x-12-8 = 0$$

$$\boxed{4x+3y-20 = 0}$$

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

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

❖ Bisection Method ❖

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

$f(2) = (2)^3 - 2(2) - 5 = -1 < 0$

$f(3) = (3)^3 - 2(3) - 5 = 16 > 0$

Thus root exists between $[2, 3]$

1st iteration:-

$x_1 = \frac{2+3}{2} = \frac{5}{2} = 2.5$

$f(2.5) = (2.5)^3 - 2(2.5) - 5 = 5.625 > 0$

Root exists between $[2, 2.5]$

2nd iteration:-

$x_2 = \frac{2+2.5}{2} = \frac{9}{4} = 2.25$

$f(2.25) = 1.89 > 0$

Now, After two iterations root exists between $\boxed{[2, 2.25]}$

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

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

$$\int_0^1 xe^x\,dx$$

$$= \left[x\int e^x dx - \int\left(\frac{d}{dx}(x)\right)\int e^x dx\,dx\right]_0^1$$

$$= xe^x - \int 1\,e^x dx\Big|_0^1$$

$$= xe^x - e^x\Big|_0^1$$

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

$$= \{e(1-1)\} - \{e^0(0-1)\}$$

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

$$\boxed{\int_0^1 xe^x dx = 1}$$

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

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

Area Bounded by curve

$$y = x^2 + 2$$

$$= \int_1^3 x^2 + 2$$

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

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

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

$$= 9 + 6 - \frac{1}{3} - 2 \Rightarrow 15 - 2 - \frac{1}{3}$$

$$= 13 - \frac{1}{3} = \frac{38}{3}$$

$$\int_1^3 x^2 + 2 \, dx = \frac{38}{3}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$y = \sqrt{x-1}$

$y^2 = x - 1$

$y^2 + 1 = x$

$y = x^2 + 1$

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

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

$\sqrt{x-1} = x - 1$

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

$x^2 - 2x + 1 = x - 1$

$x^2 - 2x + 1 - x + 1 = 0$

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

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

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

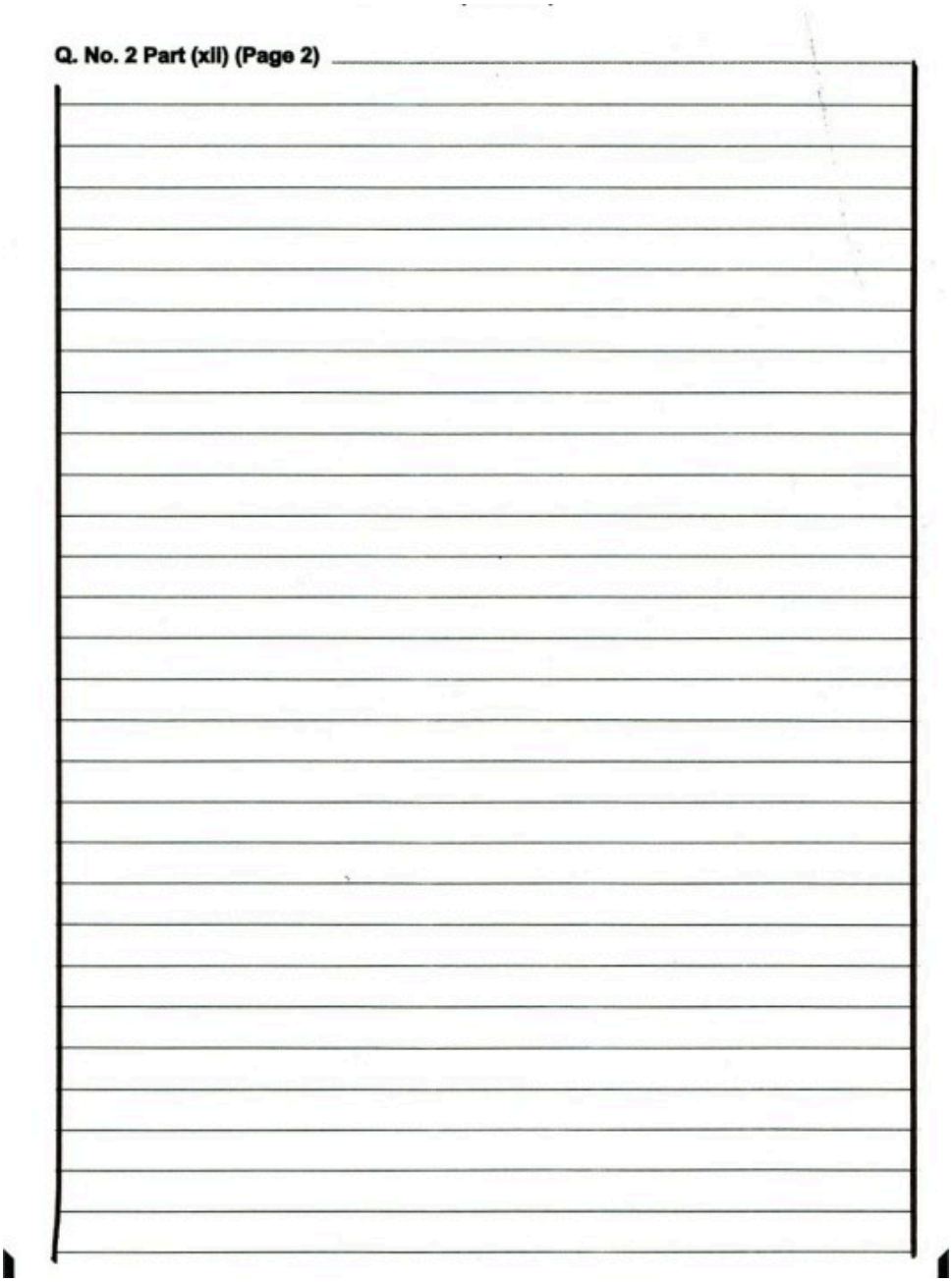
$\sqrt{x^2} = x$

$x = x$

Hence Proved

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

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



(Section C)

Q. No. 3 (Page 1)

A circle passes through;

$(0,0)$, $(2,0)$, $(0,2)$

A B D

and has centre at $C(h,k)$.

$$|\bar{AC}| = |\bar{BC}|$$

$$\sqrt{(h-0)^2+(k-0)^2} = \sqrt{(h-2)^2+(k-0)^2}$$

- By squaring Both sides,

$$(h-0)^2 + (k-0)^2 = (h-2)^2 + (k-0)^2$$

$$h^2-2(h)(0)+k^2-2(0)(k) = h^2-2(2)(h)+4+k^2$$

$$h^2+k^2 = h^2-4h+4+k^2$$

$$+4h = +4$$

$$\boxed{h = 1}$$

NOW,

$$|\bar{BC}| = |\bar{DC}|$$

$$\sqrt{(h-2)^2+(k-0)^2} = \sqrt{(h-0)^2+(k-2)^2}$$

- By squaring bothsides

$$(h)^2-2(2)(h)+4+k^2 = h^2+k^2-2(k)(2)+4$$

$$h^2-4h+4+k^2 = h^2+k^2-4k+4$$

$$-4h+4k = 0$$

put $h = 1$

$$-4+4k = 0$$

$$4k = 4$$

$$\boxed{k = 1}$$

- Thus circle has centre C at $(1,1)$

Q. No. 3 (Page 2) For radius,

$$|\overline{BC}| = \sqrt{(1-2)^2 + (1-0)^2}$$

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

equation of circle;

General Equation

$$(x-h)^2 + (y-k)^2 = r^2$$

$\therefore$

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

$$x^2 - 2x + 1 + y^2 - 2y + 1 = 2$$

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

$$\boxed{x^2 + y^2 - 2x - 2y = 0}$$ is the required equation of circle.

(B)

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

Take derivative

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

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

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

Slope of Tangent line at (0,2)

$$\frac{dy}{dx} = \frac{2-2(0)}{2(2)-2} = 1$$

Q. No. 3 (Page 3)

Equation of Tangent

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

$y - 2 = x$

$\boxed{x - y + 2 = 0}$

(C)

Normal Line

Slope of normal line $= \frac{-1}{m_T}$

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

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

$y - 2 = -x$

$\boxed{x + y - 2 = 0}$

Q. No. 3 (Page 4)

Q. No. 4 (Page 1)

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

(A) critical points

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

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

$f'(x) = 0$

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

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

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

$2\cos x = 0$

$\cos x = 0$

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

$x = \frac{\pi}{2}, \frac{3\pi}{2}$

As $\frac{3\pi}{2} \notin [0, \pi]$

$x = \frac{\pi}{2}$

$1 - 2\sin x = 0$

$-2\sin x = -1$

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

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

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

$S.S = \left\{\frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}\right\}$ are critical points.

(B) local maximum and local minimum

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

Q. No. 4 (Page 2)

❖ put $x=\frac{\pi}{2}$ in $f''(x)$

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

$= 2$

As $2 > 0$ so local minimum at $\pi/2$

❖ Now put $\frac{\pi}{6}$ in $f''(x)$

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

$= -3$

As $-3 < 0$ so

local maximum at $\frac{\pi}{6}$

❖ Now put $\frac{5\pi}{6}$ in $f''(x)$

$f''(\frac{5\pi}{6}) = -2\sin(\frac{5\pi}{6}) - 4\cos 2(\frac{5\pi}{6})$

$= -3 < 0$

local maximum at $\frac{5\pi}{6}$

(C) Absolute maximum and minimum

put $x = \frac{\pi}{2}$ in $f(x)$

$f(\frac{\pi}{2}) = 2\sin(\frac{\pi}{2}) + \cos 2(\frac{\pi}{2})$

Q. No. 4 (Page 3)

$= 2 > 0$ so

Absolute maxima at $\frac{\pi}{2}$

∴ Now put $x = \frac{\pi}{6}$ in $f(x)$

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

$$= \frac{3}{2} > 0$$

Absolute maxima at $\frac{\pi}{6}$

∴ Now put $x = \frac{5\pi}{6}$

$$f\left(\frac{5\pi}{6}\right) = 2\sin\left(\frac{5\pi}{6}\right) + \cos 2\left(\frac{5\pi}{6}\right)$$

$$= \frac{3}{2} > 0$$

Absolute maxima at $\frac{5\pi}{6}$

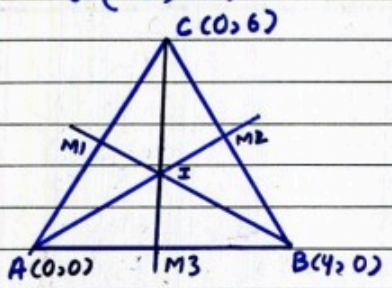
Q. No. 4 (Page 4)

Q. No. 5 (Page 1)

(MEDIANS)

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

Midpoints of lines of triangle



Midpoint of $\overline{AC}$ = M1 = $\left(\frac{0+0}{2}, \frac{0+6}{2}\right)$

= (0, 3)

Midpoint of $\overline{BC}$ = M2 = $\left(\frac{0+4}{2}, \frac{6+0}{2}\right)$

= (2, 3)

Midpoint of $\overline{AB}$ = M3 = $\left(\frac{0+4}{2}, \frac{0+0}{2}\right)$

= (2, 0)

By Two point Slope Formula;

Equation of median $\overline{BM1}$ =

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

Q. No. 5 (Page 2) $\frac{x-4}{-4} = \frac{y}{3}$

$3x - 12 = -4y$

$3x + 4y - 12 = 0$

Equation of AM_2 ❖

$\frac{x-0}{2-0} = \frac{y-0}{3-0}$

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

$3x = 2y$

$3x - 2y = 0$

Equation of CM_3 ❖

$\frac{x-0}{2-0} = \frac{y-6}{0-6}$

$\frac{x}{2} = \frac{y-6}{-6}$

$-6x = 2y - 12$

$-6x - 2y + 12 = 0$

$6x + 2y - 12 = 0$

For concurrency;

Q. No. 5 (Page 3)

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

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

$3(24-0)-4(-36-0)-12(6+12)$

$72+144-216=0$

$216-216=0$

$0=0$

This shows that Medians are concurrent at I.

To find I,

$3x+4y-12=0$

$3x-2y=0$

$+\quad -\quad +$

$6y+12=0$

$6y=-12$

$y=-2$

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

$3x+4=0$

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

$I\left(-\frac{4}{3},-2\right)$

Q. No. 5 (Page 4)

$$3x - 2y = 0$$
$$6x + 2y - 12 = 0$$
$$+ \quad + \quad +$$
$$9x - 12 = 0$$
$$9x = 12$$
$$x = \frac{12}{9}\,4 \Rightarrow \frac{4}{3}$$

$$6\left(\frac{4}{3}\right) + 2y - 12 = 0$$
$$8 + 2y - 12 = 0$$
$$-4 + 2y = 0$$
$$2y = 4$$
$$y = 2$$

$$I\left(\frac{4}{3}, 2\right)$$

Q. No. 6 (Page 1)

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

put $y = ux$

$$\frac{dy}{dx} = \frac{dux}{dx} + u$$

equation (i) becomes,

$$u + x\frac{du}{dx} = \frac{x^2+(ux)^2}{x(ux)}$$

$$u + x\frac{du}{dx} = \frac{x^2+u^2x^2}{x^2u}$$

$$u + x\frac{du}{dx} = \frac{x^2(1+u^2)}{x^2u}$$

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

$$x\frac{du}{dx} = \frac{1+u^2-u^2}{u}$$

$$x\frac{du}{dx} = \frac{1}{u}$$

Q. No. 6 (Page 2)

$$\int u\,du = \int \frac{1}{x}\,dx$$

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

$$\frac{u^2}{2} = \ln|cx| + c$$

As $y = ux$

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

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

$$\boxed{\frac{y^2}{2x^2} = \ln|x| + c}$$ is the required general solution.

Q. No. 6 (Page 3)

Q. No. 6 (Page 4)