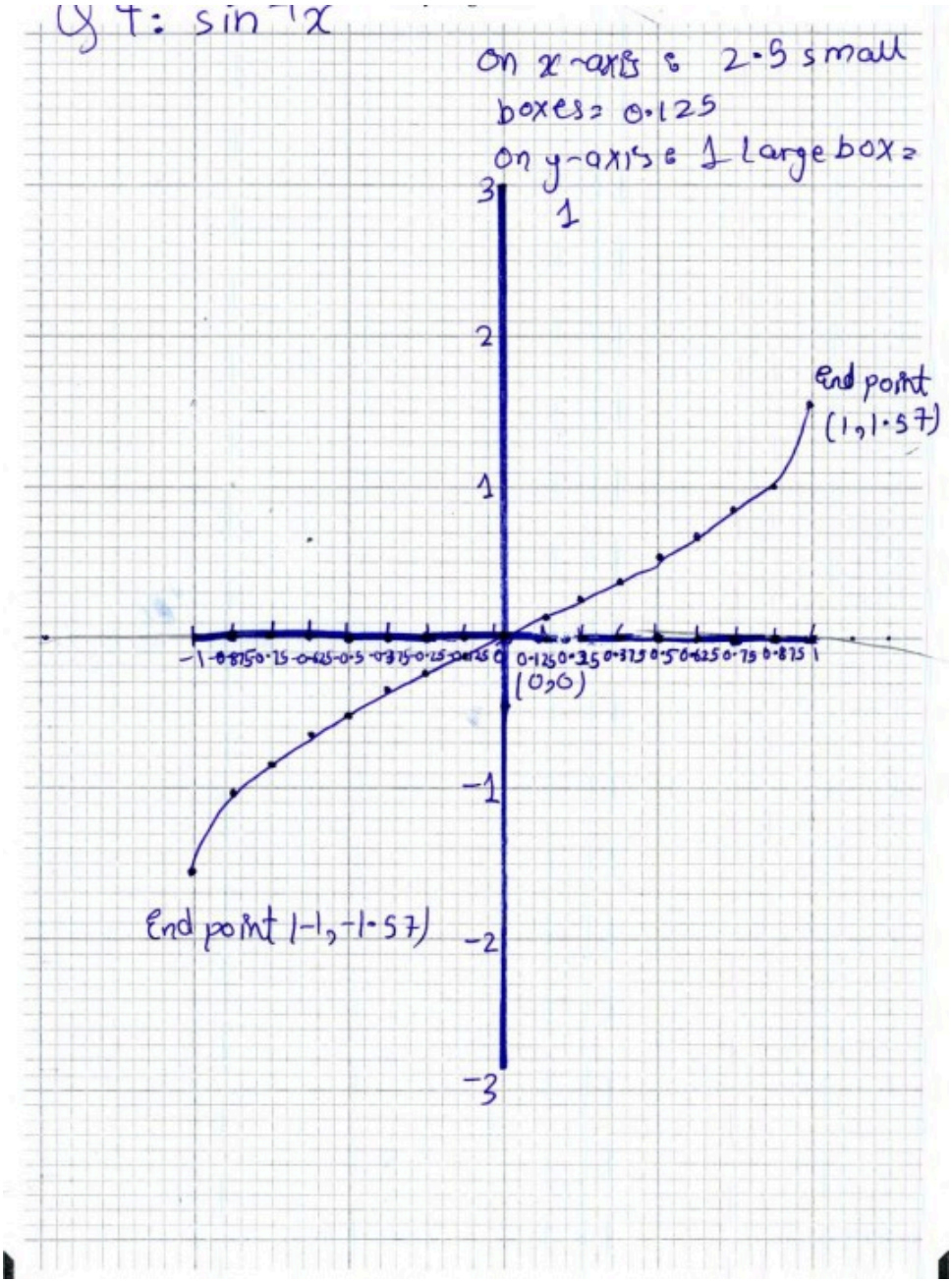
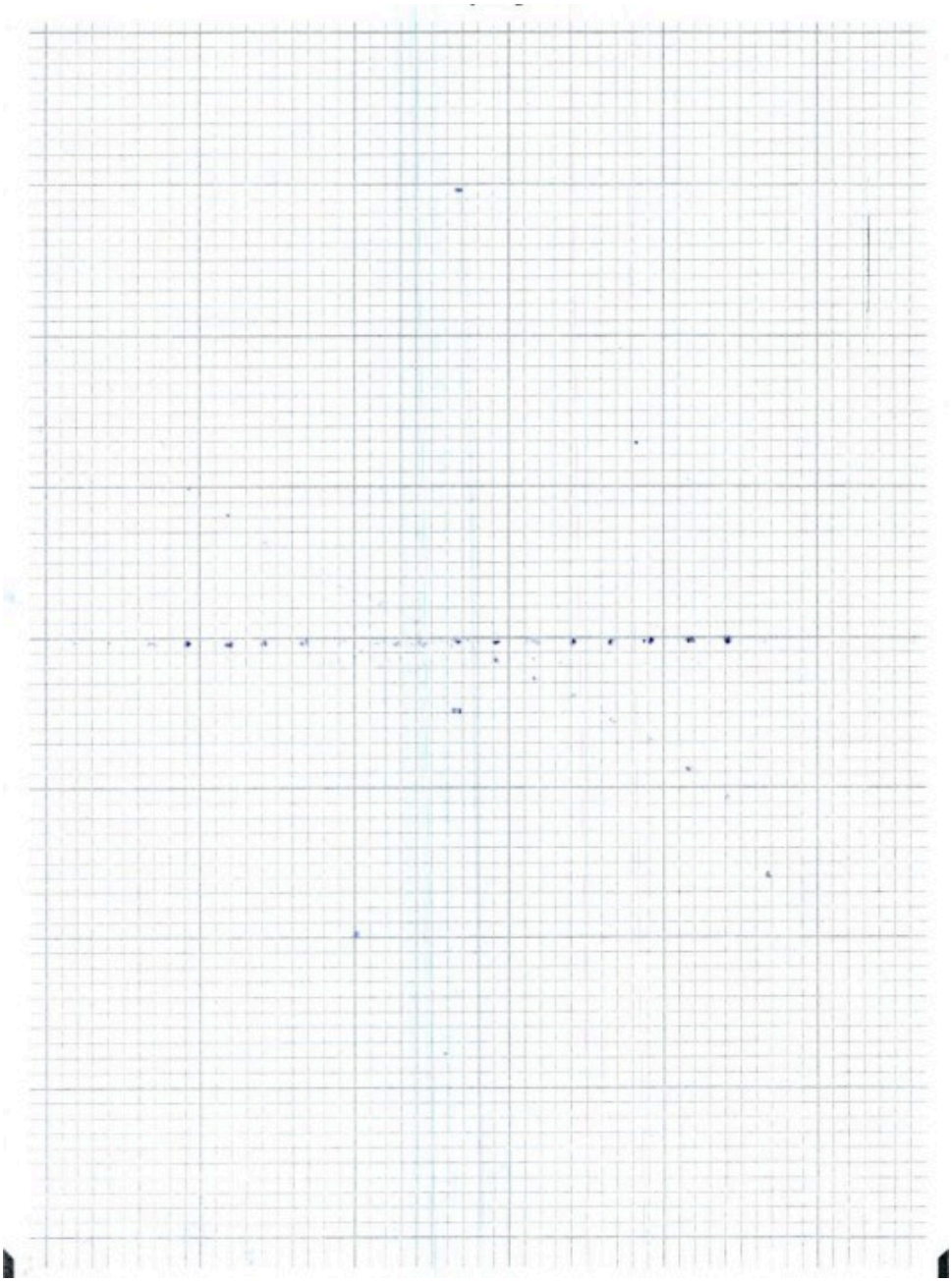
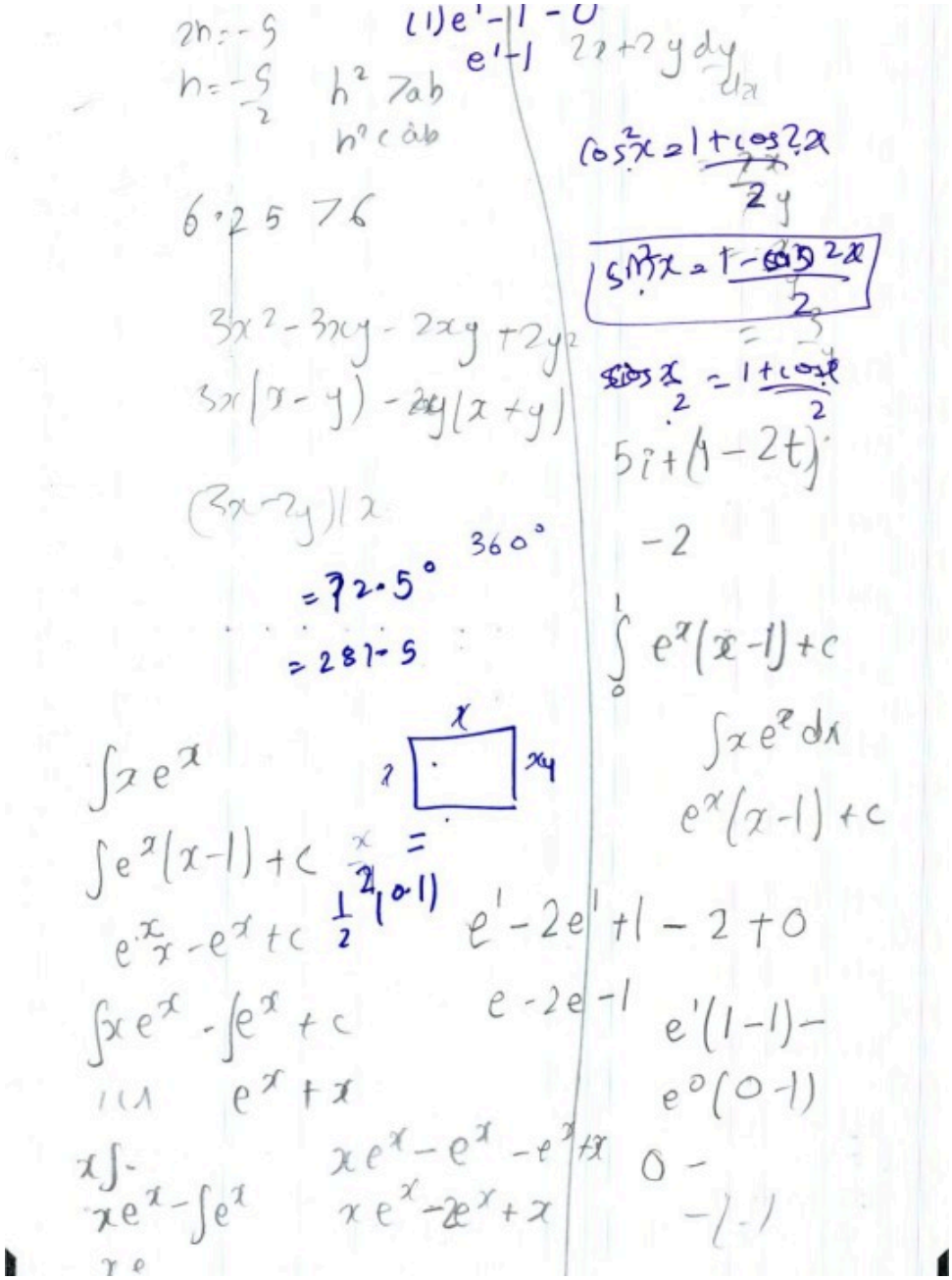
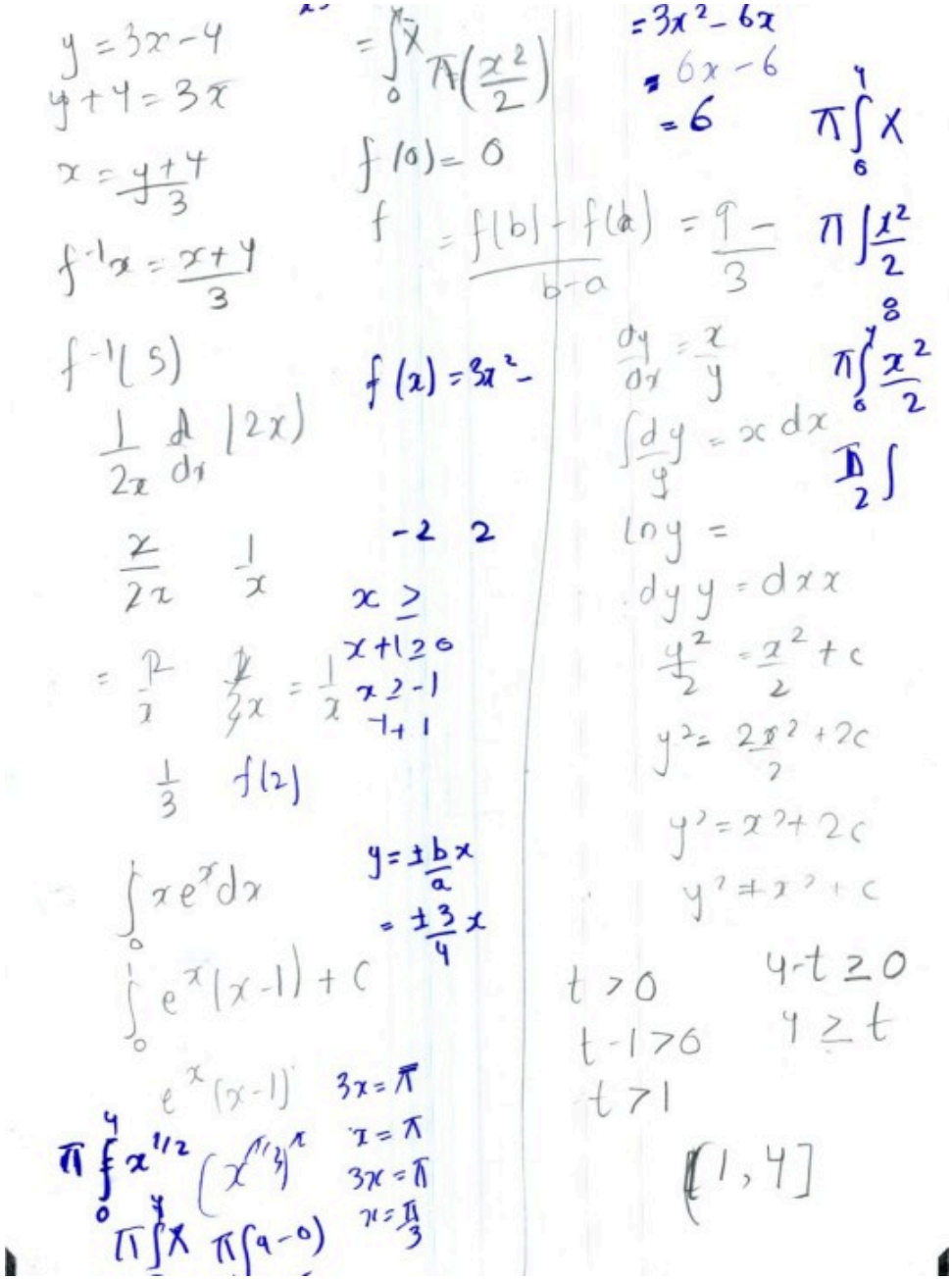

y = sin⁻¹x
On x-axis 8 2·5 small boxes = 0·125
On y-axis 8 1 large box = 1
3
2
1
−1
−2
−3
End point (1, 1·57)
End point (−1, −1·57)
(0, 0)




2h = -5
h = -5/2
h² > ab
h² < ab
6 · 25 76
3x² - 3xy - 2xy + 2y²
3x(x - y) - 2y(x + y)
(3x - 2y)(x
360°
= 72.5°
= 287.5
∫x eˣ
∫eˣ(x-1) + c
eˣ x - eˣ + c
∫x eˣ - ∫eˣ + c
eˣ + x
x∫ eˣ - ∫eˣ
x eˣ
x
x
(1) eˡ - 1 - 0
eˡ - 1
2x + 2y dy/dx
cos²x = 1 + cos 2x / 2
sin²x = 1 - cos 2x / 2
cos x/2 = 1 + cos x / 2
5i + (1 - 2t)j
-2
∫₀¹ eˣ(x-1) + c
∫x eˣ dx
eˣ(x-1) + c
eˡ - 2eˡ + 1 - 2 + 0
e - 2e - 1
eˡ(1-1) -
e⁰(0-1)
0 -
-(-1)
xeˣ - eˣ - eˣ + x
xeˣ - 2eˣ + x


y = 3x - 4
y + 4 = 3x
x = (y+4)/3
f⁻¹x = (x+4)/3
f⁻¹(5)
1/2x d/dx (2x)
x/2x 1/x
= 1/x
1/3 f(2)
∫ xe^x dx
e^x(x-1) + C
e^x(x-1)
π ∫ x^1/2
π ∫ x
= ∫ π(x²/2)
f(0) = 0
f = (f(b) - f(a))/(b-a) = 9/3
f(x) = 3x² -
-2 2
x ≥
x + 1 ≥ 0
x ≥ -1
+1 +1
y = ±(b/a)x
= ±3/4 x
3x = π
x = π
3x = π
x = π/3
π(9-0)
= 3x² - 6x
= 6x - 6
= 6
dy/dx = x/y
∫ dy/y = ∫ x dx
log y =
dy y = dx x
y²/2 = x²/2 + c
y² = 2x²/2 + 2c
y² = x² + 2c
y² = x² + c
t > 0
t - 1 > 0
t > 1
4 - t ≥ 0
4 ≥ t
[1, 4]
π ∫ x
π ∫ x²/2
∫ dy/2

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

As given,

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

As $f(x) = y$:

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

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

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

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

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

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

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

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

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

Replacing $f^{-1}y$ with $f^{-1}x$ and y with x:

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

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

Domain of $f(x) = R - \{-1\}$

Range of $f(x) = R - \{2\}$

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

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

Q. No. 2 Part (II) (Page 1) **Derivative:**

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

Taking derivative on both sides:

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

Using product rule:-

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

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

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

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

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

Q. No. 2 Part (iii) (Page 1) **Integration:**

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

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

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

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

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

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

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

Hence,

$$\boxed{\int \sin^2 x \, dx = \frac{x}{2} - \frac{\sin 2x}{4} + c}$$

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

Q. No. 2 Part (iv) (Page 1) **Separable differential equations:**

As given,

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

Separating:

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

Taking integration on both sides:

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

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

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

Taking e on both sides:

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

$$\boxed{y = (x-2)c - 1}$$

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

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

Homogenous Equation:

(a) As in the following equation:

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

In this equation, $c = 0$. This means that this line represents a pair of lines passing through the origin.

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

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

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

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

Individual line equations are:

$3x - 2y = 0$

$x - y = 0$

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

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

As given:

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

$$\boxed{\text{Reference angle} = x = \frac{\pi}{3}}$$

As $\cos x$ is negative in Quadrant II and III :-

Quadrant II : $= \pi - x$

$$= \pi - \frac{\pi}{3}$$
$$\boxed{= \frac{2\pi}{3}}$$

Quadrant III : $\pi + x$

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

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

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

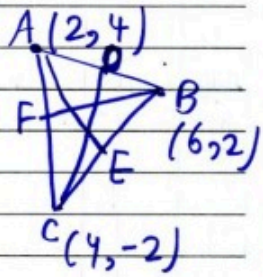
Q. No. 2 Part (vii) (Page 1) **Parabola:**

As given $y^2 = +12x$

It is horizontal parabola.

To find equation of CD:

Midpoint of AB = OD =



$\left(\frac{2+6}{2}, \frac{4+2}{2}\right)$

$\left(\frac{8}{2}, \frac{6}{2}\right)$

$OD = (4, 3)$

Slope of CD $= x_1 = 4, y_1 = -2, x_2 = 4, y_2 = 3$

$m = \frac{3+2}{4-4} = \boxed{\frac{5}{0}}$

Equation of CD: $x_1 = 4 \quad y_1 = 3$

$y - 3 = \frac{5}{0}(x - 4)$

$5x - 20 = 0$

$(x - 4) = 0$

$\boxed{x - 4 = 0}$

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

Midpoint of BC (OF):

$= \left(\frac{6+4}{2}, \frac{2-2}{0}\right)$

$OF = (5, 0)$

Slope of AF $= x_1 = 2, y_1 = 4, x_2 = 5, y_2 = 0$

$m = \frac{0-4}{5-2} = \frac{-4}{3}$

Equation: $x_1 = 5, y_1 = 0$

$y - 0 = \frac{-4}{3}(x - 5)$

$3y = -4x + 20$

$4x + 3y - 20 = 0$

Equation: $x_1 = 3, y_1 = 1$

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

$3y - 3 = x - 3$

$x - 3y - 3 + 3$

$x - 3y = 0$

Midpoint of AC = OF:

$= \left(\frac{2+4}{2}, \frac{4-2}{2}\right)$

$= (3, 1)$

Thus the median equation is

$4x + 3y - 20 = 0$

Slope of BF:

$x_1 = 6, y_1 = 2, x_2 = 3, y_2 = 1$

$m = \frac{1-2}{3-6}$

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

$m = \frac{1}{3}$

Q. No. 2 Part (viii) (Page 1) **Bisection Method:**

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

$f(2) = -1$

$f(3) = 16$

As $f(2)$ and $f(3)$ have opposite signs so root lies in the interval **[2,3]**

Iteration 1:

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

$f(2.5) = 5.625$ +ive

2 (-ive) — 2.5 (+ive) — 3 (+ive)

So root lies in between **[2, 2.5]**

Iteration 2:

$c = \frac{2+2.5}{2} = 2.25$

$f(2.25) = 1.8906$

2 (-ive) — 2.25 (+ive) — 2.5 (+ive)

So root lies in between **[2, 2.25]**

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

The root after two iterations is

$c = 2.25$

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

Integration by Parts:-

As given $\int_0^1 xe^x dx$

We know that:

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

Here,

$u = x$, $v = e^x$

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

$= \left[xe^x - \int e^x(1)\right|_0^1$

$= \left[xe^x - e^x\right|_0^1$

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

$= e - e - 0 + e^0$

$= e^0$

$= 1$

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

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

$$\text{Area} = \int_1^3 (x^2+2)\,dx$$

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

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

$$= 9 + 6 - \left(\frac{1}{3} + 2\right)$$

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

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

Area = 12.66 sq. units

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

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

Derivative :-

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

Taking derivative :-

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

By quotient rule :-

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

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

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

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

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

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

Q. No. 2 Part (xii) (Page 1) **Inverse:**

As given,

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

As $f(x) = y$:

$y = \sqrt{x-1}$

Taking square on both sides:

$y^2 = x - 1$

$y^2 + 1 = x$

$x = y^2 + 1$

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

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

Replacing y with x:

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

(ii)

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

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

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

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

$= \sqrt{x^2}$

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

Hence proved.

(Section C)

Q. No. 3 (Page 1)

(b)

As given,

Circle passes through (0,0), (2,0) and (0,2):

Equation of circle is given as:

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

For (0,0):

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

$$\boxed{c=0}$$

For (2,0):

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

$$4+4g=0$$

$$4g=-4$$

$$\boxed{g=-1}$$

For (0,2):

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

$$4+4f=0$$

$$4f=-4$$

$$\boxed{f=-1}$$

Q. No. 3 (Page 2) **Equation of circle:**

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

$c=0 \quad g=-1 \quad f=-1$

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

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

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

(b) Taking derivative of equation:

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

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

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

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

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

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

$\frac{dy}{dx}\Big|_{0,2}=\frac{1-0}{2-1}$

$=\frac{1}{1}$

$\boxed{\text{Slope of tangent} = 1}$

Q. No. 3 (Page 3)

Equation of tangent:-

$x_1 = 0$, $y_1 = 2$, $m = 1$

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

$y - 2 = x$

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

(b) Slope of normal :-

As normal line is perpendicular to tangent line so its slope will:

$$\text{Slope of normal} = \frac{-1}{\text{slope of tangent}}$$

$m_2 = \frac{-1}{1}$

$m_2 = -1$

Equation of normal:

$x_1 = 0$, $y_1 = 2$, $m = -1$

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

$y - 2 = -x$

$\boxed{x + y - 2}$

Q. No. 3 (Page 4)

Eq of circle:

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

Eq of tangent:

$$x-y+2=0$$

Eq of normal:

$$x+y-2=0$$

Q. No. 4 (Page 1)

As given,

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

The domain of given function is $[-1, 1]$

So we will draw graph from -1 to 1.

x	-1	-0.875	-0.75	-0.625	-0.5	-0.375
y	-1.57	-1.065	-0.848	-0.675	-0.523	-0.3843

-0.25	-0.125	0	0.125	0.25	0.375
-0.2527	-0.125	0	0.1253	0.2526	0.3843

0.5	0.625	0.75	0.875	1
0.523	0.675	0.848	1.065	1.57

Domain $= [-1, 1]$

Range $= \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

Intercepts $= (0, 0)$

endpoints $= (-1, -1.57)$

$(1, 1.157)$

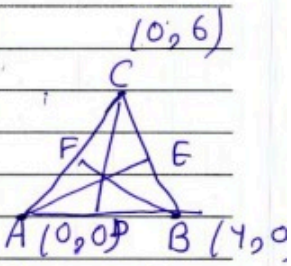
Q. No. 4 (Page 2)

Q. No. 4 (Page 3)

Q. No. 4 (Page 4)

Q. No. 5 (Page 1)

Equation of CD:



Midpoint of AB = OD =

$\left(\frac{0+4}{2}, \frac{0+0}{2}\right)$

$(2, 0)$

Slope of CD: $x_1 = 0$ $y_1 = 6$ $x_2 = 2$ $y_2 = 0$

$m = \frac{0-6}{2-0} = \frac{-6}{2} = -3$

Equation: $x_1 = 2$, $y_1 = 0$

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

$y = -3x + 6$

$3x + y - 6 = 0$

Equation of BF AE:

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

$= (2, 3)$

Slope of AF = $x_1 = 0$ $y_1 = 0$ $x_2 = 2$ $y_2 = 3$

$m = \frac{3-0}{2-0}$

$m = \frac{3}{2}$

Q. No. 5 (Page 2)

Equation:

$x_1 = 2 \quad y_1 = 3$

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

$2y - 6 = 3x - 6$

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

Equation of BF:

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

$= (0, 3)$

Slope of BF: $x_1 = 4 \quad y_1 = 0 \quad x_2 = 0 \quad y_2 = 3$

$m = \frac{3-0}{0-4}$

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

Equation: $x_1 = 0 \quad y_1 = 3$

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

$4y - 12 = -3x$

$\boxed{3x + 4y - 12 = 0}$

Q. No. 5 (Page 3)

Proof:

Medians are $(3, 1, -6)$
$(3, -2, 0)$
$(3, 4, -12)$

They will be concurrent when

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

$= 3(24-0) - 1(-36-0) - 6(12+6)$

$= 72 + 36 - 6(18)$

$= 72 + 36 - 108$
$= 108 - 108$
$= 0$

Hence Proved.

(c) Taking equation:

$3x - 2y = 0 \quad -(i)$
$3x + 4y - 12 = 0 \quad -(ii)$

solving them:

Q. No. 5 (Page 4) Subtracting both equation,

$$3x - 2y = 0$$
$$-3x \oplus 4y + 12 = 0$$
$$-6y + 12 = 0$$
$$-6y = -12$$
$$\boxed{y = 2}$$

Putting in eqn (i):

$$3x - 2y = 0$$
$$3x - 2(2) = 6$$
$$3x = 4$$
$$\boxed{x = \frac{4}{3}}$$

Hence centroid $= \left(\frac{4}{3}, 2\right)$

Q. No. 6 (Page 1) **Homogenous differential Equation :-**

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

Let $y = ux$

$$\frac{dy}{dx} = \frac{d}{dx}(ux)$$

$$\frac{dy}{dx} = u\frac{dx}{dx} + x\frac{du}{dx}$$

$$\frac{dy}{dx} = u + x\frac{du}{dx}$$

Putting in eq(i)

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

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

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

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

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

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

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

Q. No. 6 (Page 2)

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

Taking integration on both sides:

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

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

As $y = ux \Rightarrow u = \frac{y}{x}$

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

or

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

or

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

or

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

or

$$\boxed{y^2 = x^2(\ln x^2 + c)}$$

Q. No. 6 (Page 3)

Q. No. 6 (Page 4)