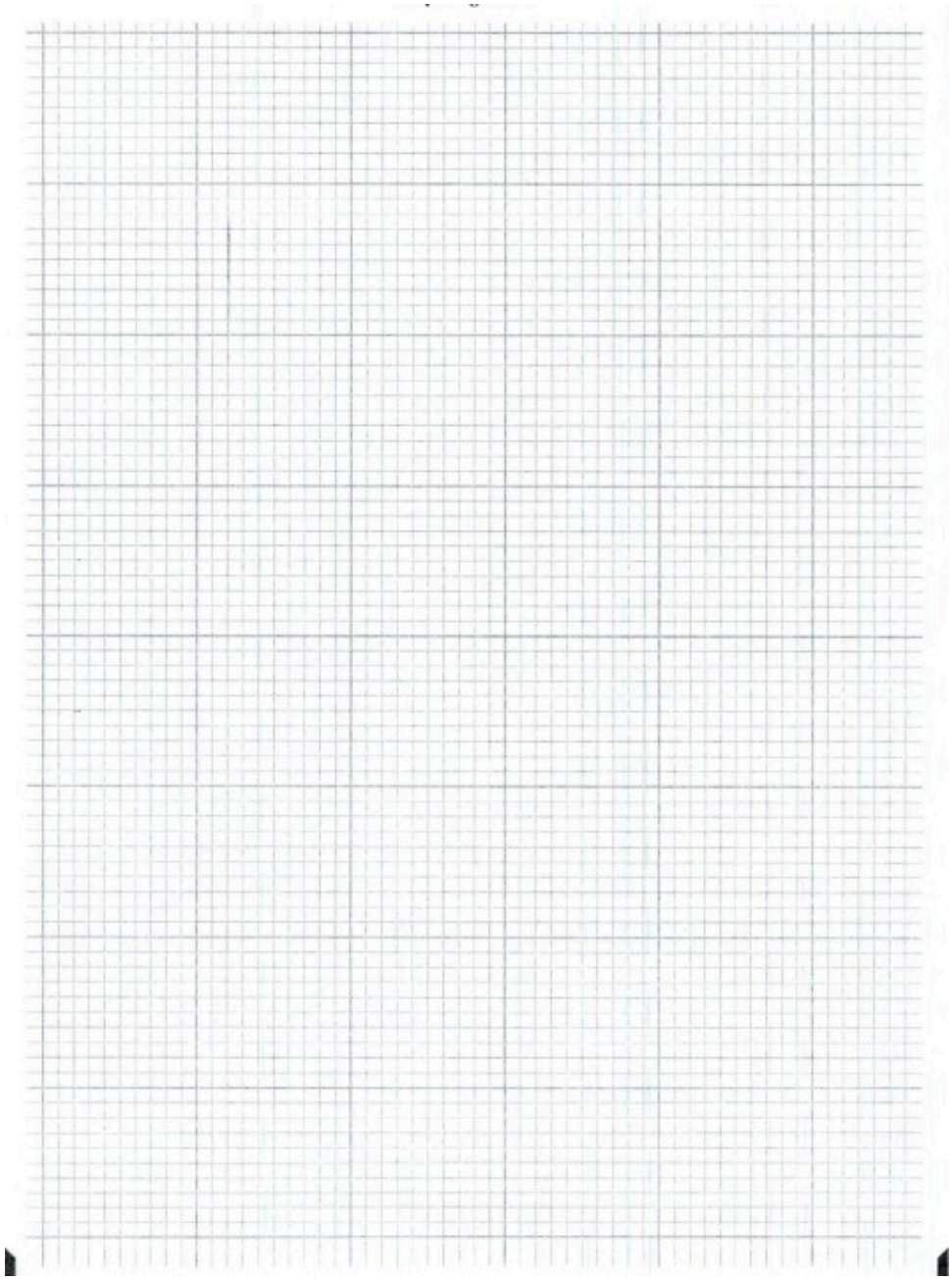
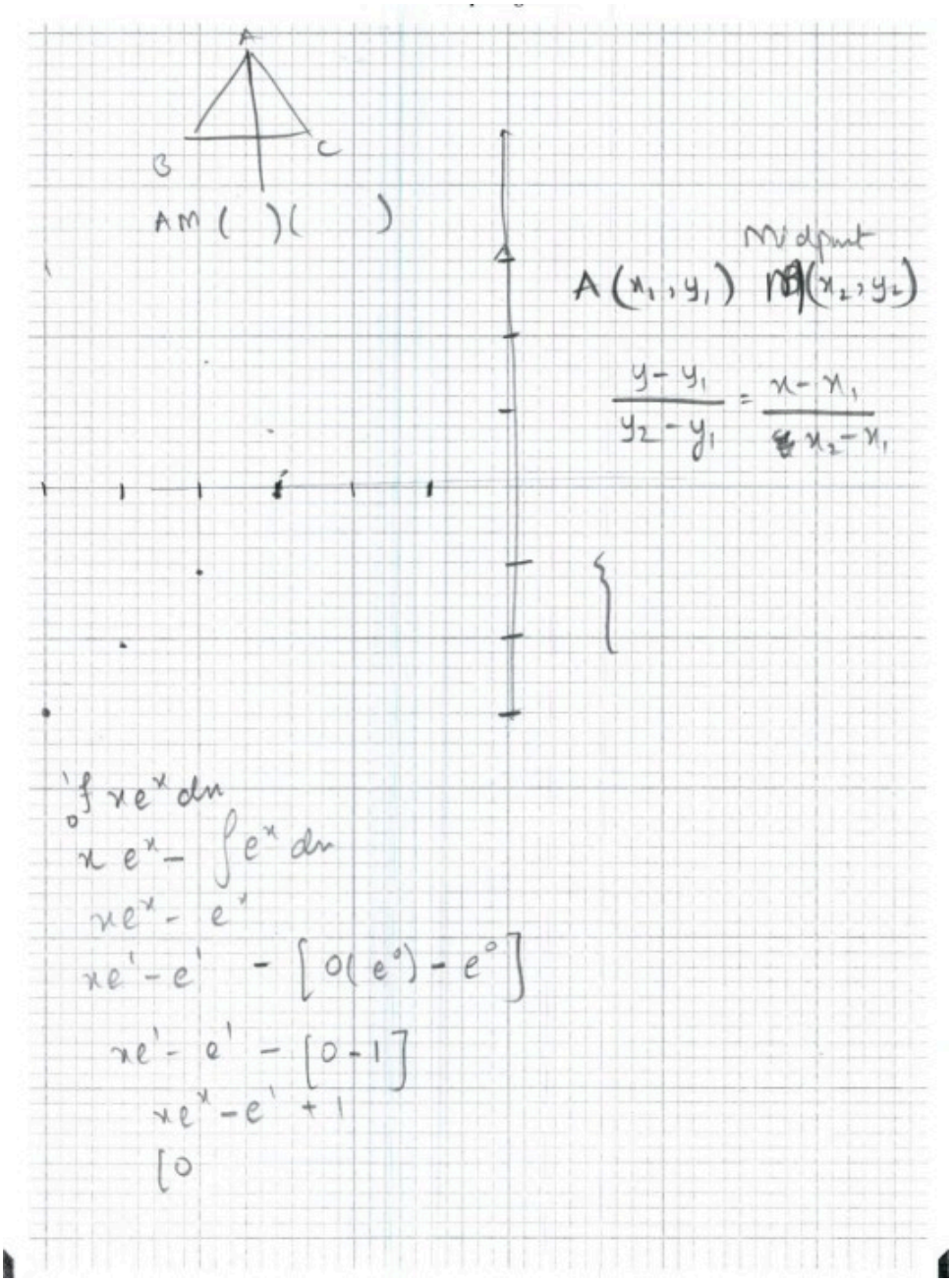



A
B
C
AM ( )( )
Midpoint
A(x1, y1) B(x2, y2)
(y − y1)/(y2 − y1) = (x − x1)/(x2 − x1)
∫ xe^x dx
x e^x − ∫ e^x dx
xe^x − e^x
xe^1 − e^1 − [0(e^0) − e^0]
xe^1 − e^1 − [0 − 1]
xe^x − e^1 + 1
[0

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

$$e^{2x}\frac{d}{dx}\ln + \ln x \frac{d}{dx}e^{2x}$$

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

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

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

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

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

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

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

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

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

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

$$2x_1x_2 - 3x_2 + 2x_1 - 3$$

$$2x_1x_2 - 3x_1 + 2x_2 - 3$$

$$-3x_2 - 2x_2 = -3x_1 - 2x_1$$

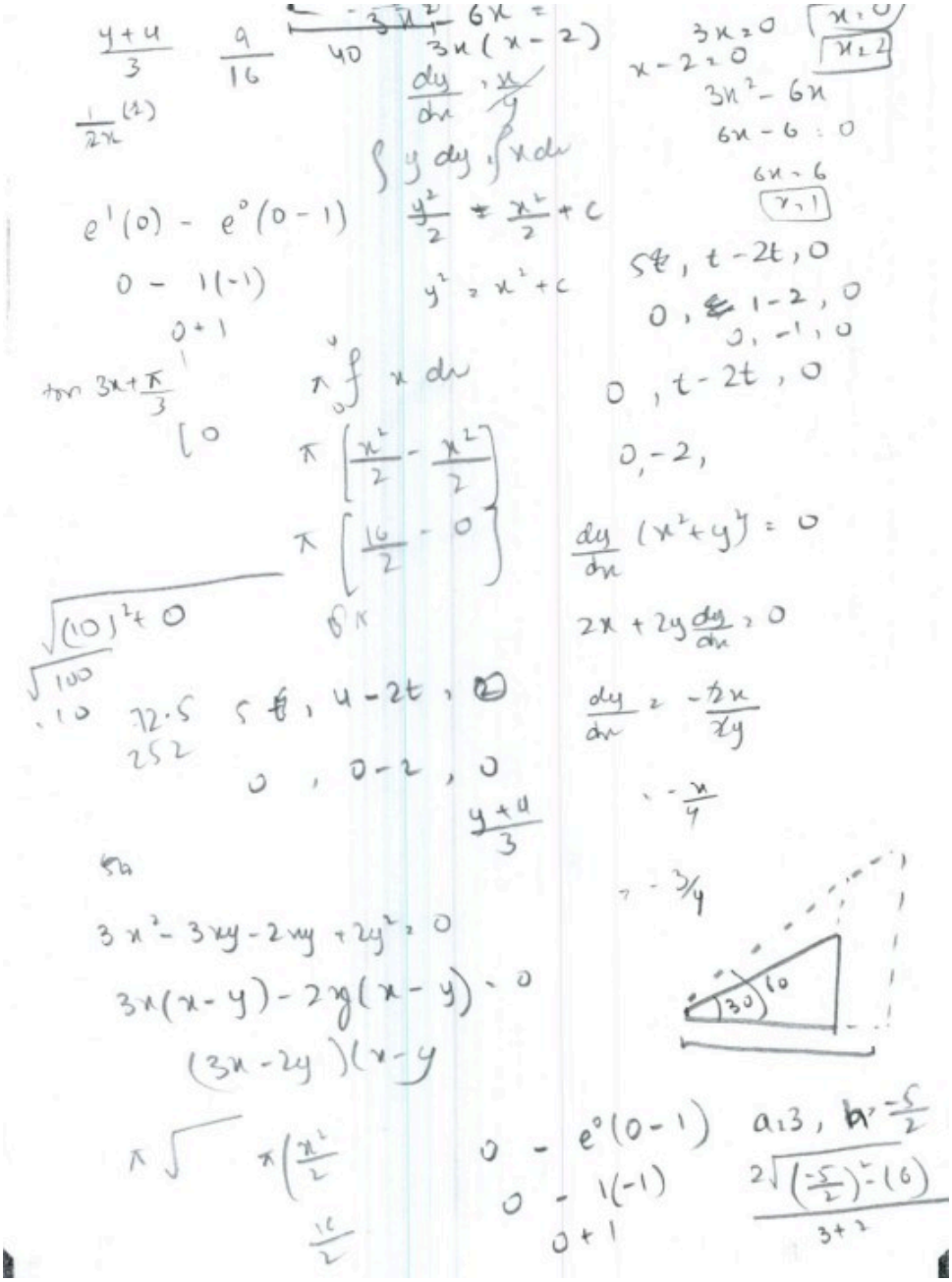
$$x_2(-5) = -5x_1$$

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

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

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

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



$\frac{y+4}{3}$ $\frac{9}{16}$ $\frac{1}{2x}(2)$

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

$0 - 1(-1)$

$0+1$

$3x^2 - 6x = 40$

$3x(x-2)$

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

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

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

$y^2 = x^2 + c$

$3x = 0$ $x = 0$

$x - 2 = 0$ $x = 2$

$3x^2 - 6x$

$6x - 6 = 0$

$6x = 6$

$x = 1$

$5t, t-2t, 0$

$0, 5t-2, 0$

$0, -1, 0$

$0, t-2t, 0$

$0, -2,$

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

$\pi \int_0^{\cdot} x\,dx$

$\left[0\right.$

$\pi\left[\frac{x^2}{2} - \frac{x^2}{2}\right]$

$\pi\left[\frac{16}{2} - 0\right]$

$\sqrt{(10)^2 + 0}$

$\sqrt{100}$

10

72.5

252

$5t, 4-2t, 0$

$0, 0-2, 0$

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

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

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

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

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

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

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

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

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

$\pi\sqrt{\quad}$ $\pi\left(\frac{x^2}{2}\right.$

$\frac{12}{2}$

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

$0 - 1(-1)$

$0+1$

$a=3, b=\frac{-5}{2}$

$2\sqrt{\left(\frac{-5}{2}\right)^2 - (6)}$

$3+2$

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

$f(x) = \frac{2x-3}{x+1}$ a) $f^{-1}(x) = ?$ b) D & R of $f^{-1}(x)$

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

replacing x by y in eq $y = \frac{2x-3}{x+1}$

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

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

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

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

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

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

b) Domain of $f^{-1}(x)$ = All real number except 2

$= (-\infty, 2) \cup (2, \infty)$

Range of $f^{-1}(x) = (-\infty, -1) \cup (-1, \infty)$

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

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

$xy + x = 2y - 3$

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

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

xy

$2y - xy = x + 3$

x

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

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

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

$xy + x = 2y - 3$

$2y - xy = x - 3$

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

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

$2 \quad \mathbb{R} - \{-1\}$

$(2, \infty)$

$(-1, \infty)$

$(-1, \infty)$

$(-\infty, -1) \cup (-1, \infty)$

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

$y = e^{2x} \ln x \qquad \frac{dy}{dx} = ?$

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

$\because$ using product rule

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

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

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

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

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

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

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

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

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

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

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

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

as $C/2 = C$

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

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

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

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

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

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

Integrating on b/s

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

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

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

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

Canceling ln on b/s

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

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

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

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

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

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

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

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

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

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

(a)

It can be identified using 2 methods

i) putting (0, 0) in equation

LHS

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

$= 0 - 0 + 0$

$= 0$

RHS

$= 0$

As LHS = RHS so it passes through origin

ii) It can be assured by graph table

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

x	-4	-3	-2	-1	0	1	2	3	4
y	48	27	12	3	0	3	12	27	48

From the boxed table it can be seen that there's a point where x & y both are 0 at same time so it passes through origin

(b)

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

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

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

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

$3x - 2y = 0$ $\quad$ $x - y = 0$

These are the two equations of lines.

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

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

$2\cos x + 1 = 0 \qquad [0, 2\pi)$

$2\cos x = -1$

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

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

$= 2\pi/3$

For first quadrant: $\because \cos\theta$ is +ve in 1st & 4th quadrant

$\theta = x$

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

For 4th quadrant. Solution set: $\left\{\frac{2\pi}{3}, \frac{4\pi}{3}\right\}$

$\theta = 2\pi - x$

$= 2\pi - 2\pi/3$

$= 4\pi/3$

Checking for both:

when $x = 2\pi/3$

$2\cos x + 1 = 0$

LHS	RHS
$2\cos\left(\frac{2\pi}{3}\right) + 1$	$= 0$
$= -1 + 1$	
$= 0$	
LHS = RHS	

when $x = 4\pi/3$

$2\cos x + 1 = 0$

LHS	RHS
$= 2\cos\left(\frac{4\pi}{3}\right) + 1$	$= 0$
$= -1 + 1$	
$= 0$	
LHS = RHS	

Hence $x = 2\pi/3$ & $x = 4\pi/3$, both are solutions so, S. Set: $\left\{\frac{2\pi}{3}, \frac{4\pi}{3}\right\}$

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

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

$r'(t) = 2t\,\hat{i} + 0\,\hat{j} + \frac{1}{t+1}(1)\,\hat{k}$

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

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

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

S	A
T	C

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

$= 120$

In 4th quad

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

$= \frac{6\pi - 2\pi}{3}$

$= 240$

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

$y^2 = -12x$

(a) Vertex :

$(y-0)^2 = -12(x-0)$

vertex is $(0, 0)$

(b) Focus :

$(-a, 0)$

For a :

comparing $y^2 = -12x$ and $y^2 = -4ax$

$4a = 12$

$\boxed{a = 3}$

So focus is $(-3, 0)$

(c) Directrix :

$x = a$

$x = 3$

$\boxed{x - 3 = 0}$

(d) length of latus rectum.

$= 4a$

$= 4(3)$

$\boxed{4a = 12}$

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

$y^2 = 12x$

$y^2 = -4ax$

$4a = 12$

$\boxed{a = 3}$

$(0,0)$

$(-a, 0)$

$x = a$

$4a$

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

Bisection method

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

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

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

$= -1 < 0$

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

$= 16 > 0$

$[2, 3]$

$x_0 = \frac{2+3}{2}$

$= 2.5$

$f(x_0) = (2.5)^3 - 2(2.5) - 5$

$= 5.625 > 0$

$[2, 2.5]$

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

$= 2.25$

$f(x_1) = (2.25)^3 - 2(2.25) - 5$

$= 1.89 > 0$

$[2, 2.25]$

$x_2 = \frac{2+2.25}{2}$

$= 2.125$

$f(x_2) = (2.125)^3 - 2(2.125) - 5$

$= 0.34 > 0$

$[2, 2.125]$

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

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

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

For

$$\int x e^x \, dx$$

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

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

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

For $\int_0^1 x e^x \, dx$

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

$$= \left[1e^1 - e^1 \right] - \left[0e^0 - e^0 \right] \qquad e^0 = 1$$

$$= [e - e] - [0 - 1]$$

$$= 0 - 0 + 1$$

$$= 1$$

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

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

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

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

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

$$\left[\frac{27}{3} + 6\right] - \left[\frac{1}{3} + 2\right]$$

$$= 15 - 7/3$$

$$\int_1^3 (x^2+2)\,dx = 38/3$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$f(x) = \sqrt{x-1}$ — ① a) $f^{-1}(x) = ?$ b) $f(f^{-1}(x)) = x$

(a) let $f(x) = y$

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

replacing y by x

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

putting in eq ①

$x = \sqrt{y-1}$

$x^2 = y - 1$

$x^2 + 1 = y$

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

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

(b) $f(f^{-1}(x)) = x$ [proof]

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

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

$= \sqrt{x^2}$

$= x$

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

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

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

$y = \sqrt{x}$

f^{-1} replace x by y

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

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

$x = \sqrt{y-1}$

$x^2 = y - 1$ $\quad$ replacing by y by x

$x^2 + 1 = y$

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

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

$= x$

$\sqrt{x^2}$

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

$= x - 1 + 1$

$= x$

(Section C)

Q. No. 3 (Page 1)

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



For (0,2) and (0,0)

$$\sqrt{(x-0)^2+(y-0)^2} = \sqrt{(x-0)^2+(y-2)^2}$$

$$x^2+y^2 = x^2+y^2-4y+4$$

$$4y = 4$$

$$\boxed{y = 1}$$

now for (0,0) and (0,0)

$$\sqrt{(x-0)^2+(y-0)} = \sqrt{(x-0)^2+(y-0)^2}$$

$$\sqrt{x^2+y^2} = \sqrt{x^2+y^2}$$

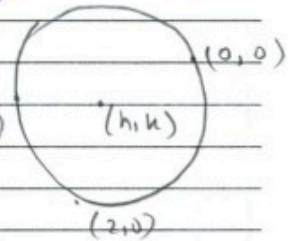
$$= 0$$

for (0,0) and (2,0)

$$\sqrt{x^2+y^2} = \sqrt{(x-2)^2+(y-0)^2}$$

$$x^2+y^2 = x^2-4x+4+y^2$$

Q. No. 3 (Page 2)



~~For dis b/w (h,k) and (0,0)~~

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

~~dis from (h,k) to (0,0) and (2,0)~~

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

For cntin condition is

$x=1$

$\lim_{x\to 1^-} f(x) = \lim_{x\to 1^+} f(x) = \lim_{x\to 1} f(x)$

For $x = 1$:

$$ax^2+bx+2 = 3x+a = ax^2+bx+2$$

put $x=1$

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

$$\boxed{b = 1}$$

Q. No. 3 (Page 3)

From $x=3$

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

$$3(3)+a = \frac{2(3)^2+b}{3}$$

$$9+a = 18+b$$

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

$$3a-b = 18-27$$

$$3a-b = -9$$

putting $b=1$

$$3a-1 = -9$$

$$3a = -8$$

$$\boxed{a = -8/3}$$

From given condition $a = -8/3$ and $b = 1$

Q. No. 3 (Page 4)

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

At $x = 1$

which means $x < 1$, $x \ge$, $x = 1$

$a+b+2 = (3(1)+a)$

$a+b+2 = 3a$ $\quad a \quad 2a-b-2=0$

$3x+a \quad 3(3)+a = \frac{18+b}{3}$

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

$9a+a^2 = 18+b$

$27+3a = 18+b$

$3a-b+9=0$

$3a-b = -9$

$-2a-b = 2$

$5a = -11$

$a = -11/5$

$3\left(\frac{-11}{5}\right)-b = -9$

$\frac{-33}{5}+9 = b$

$b = 12/5$

$\frac{-11}{5}x^2+\frac{12}{5}x+2$

$3x+a = -\frac{11}{5}$

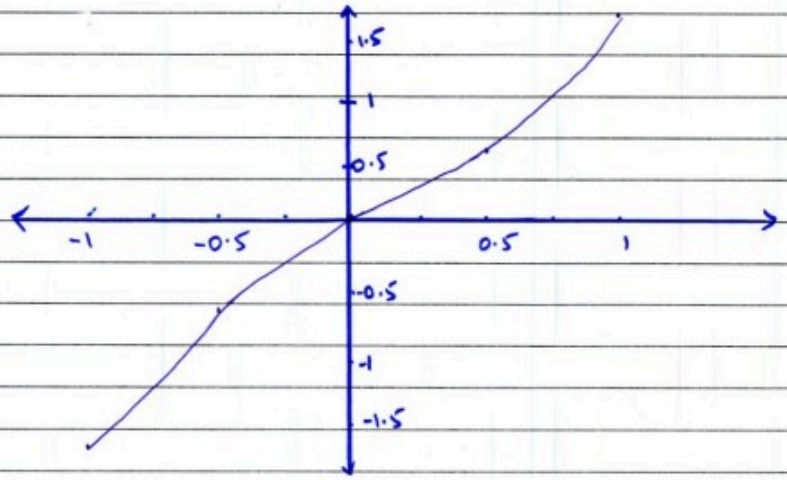
$\frac{-11}{5}+\frac{12}{5}+2$

$\frac{11}{5}$

Q. No. 4 (Page 1)

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

x	-1	-0.5	0	0.5	1
y	-1.57	-0.523	0	0.523	1.57



Q. No. 4 (Page 2)

Q. No. 4 (Page 3)

Q. No. 4 (Page 4)

Q. No. 5 (Page 1)

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

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

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

put $x = 1$

$$(1)^2+3(1)+4 = \cancel{(Ax+B)(1-1)} + C(1+2(1)+5)$$

$$8 = 8C$$

$$\boxed{C = 1}$$

opening eq ①

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

comparing $x^2 \rightarrow$

$$1 = A + C$$

$$1 = A + 1$$

$$\boxed{A = 0}$$

comparing $x \rightarrow$

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

$$3 = -0 + B + 2$$

$$\boxed{1 = B}$$

Q. No. 5 (Page 2)

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

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

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

$$\int \frac{1}{(x+2)^2+(1)^2}\,dx$$

let $x+2 = \tan\theta \Rightarrow \theta = \tan^{-1}(x+2)$

$$\frac{dx}{d\theta} = \sec^2\theta$$

$$dx = \sec^2\theta\,d\theta$$

$$\int \frac{\sec^2\theta}{(\tan\theta)^2+1}\,d\theta$$

$$= \int \frac{\sec^2\theta}{\tan^2\theta+1}\,d\theta$$

$$= \int \frac{\sec^2\theta}{\sec^2\theta}\,d\theta$$

$$= \int 1\,d\theta$$

$$= \theta + C$$

$$= \tan^{-1}(x+2) + C \quad -(3)$$

Q. No. 5 (Page 3)

putting eq ③ in eq ②

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

Q. No. 5 (Page 4)

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

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

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

put $x=1$

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

$$8 = 8C$$

$$\boxed{C=1}$$

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

$x^2 \longrightarrow$

$$1 = A + C$$

$$1 = A + 1$$

$$\boxed{A=0}$$

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

$$3 = -0 + B + 2$$

$$\boxed{1 = B}$$

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

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

$$x^2+3x+4$$

Q. No. 6 (Page 1)

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

let $y = ux$

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

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

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

$\because$ putting $y = ux$ in eq (1)

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

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

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

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

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

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

Q. No. 6 (Page 2)

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

$$\frac{du}{dx} = \frac{1}{ux}$$

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

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

putting $y = ux \Rightarrow u = y/x$ back

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

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

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

Q. No. 6 (Page 3)

Q. No. 6 (Page 4)

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

$$y = ux$$

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

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

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

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

$$\frac{du}{dx} = \frac{1}{ux}$$

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

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

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

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