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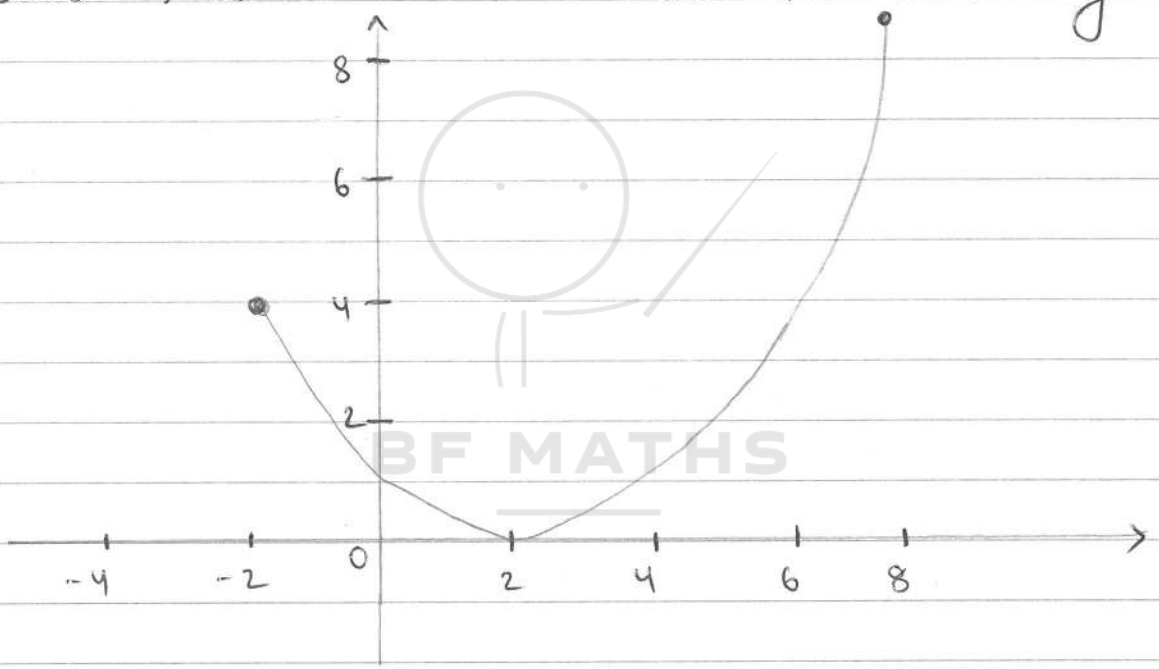
8.3 Curve Sketching

1] $x = 2t + 2$ $\quad y = t^2$

t	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3
$x = 2t + 2$	-2	-1	0	1	2	3	4	5	6	7	8
$y = t^2$	4	2.25	1	0.25	0	0.25	1	2.25	4	6.25	9

Sub the t-values in x and y.



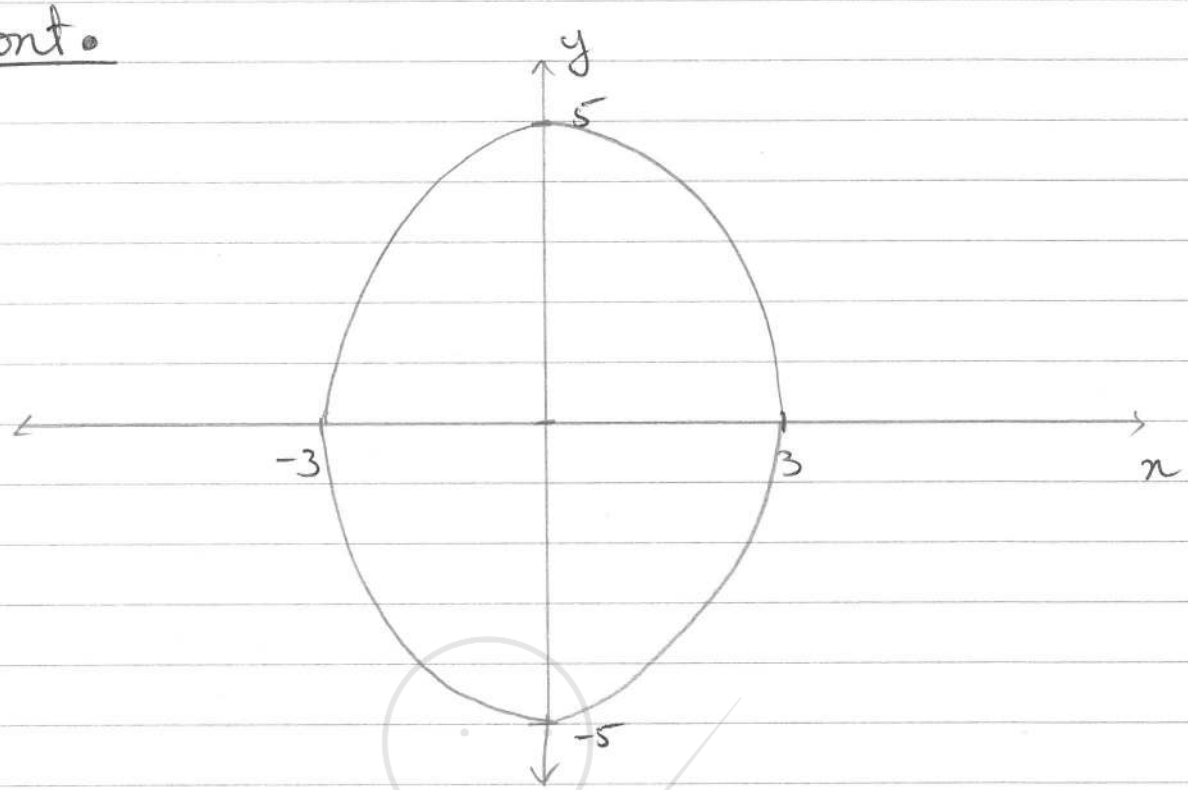
2] $x = 3\sin t$ $\quad y = 5\cos t$

t	0	$\pi/4$	$\pi/2$	$3\pi/4$	π	$5\pi/4$	$3\pi/2$	$7\pi/2$	2π
$x = 3\sin t$	0	2.12	3	2.12	0	-2.12	-3	-2.12	0
$y = 5\cos t$	5	3.54	0	-3.54	-5	-3.54	0	3.54	5

Sub t-values in x and y.

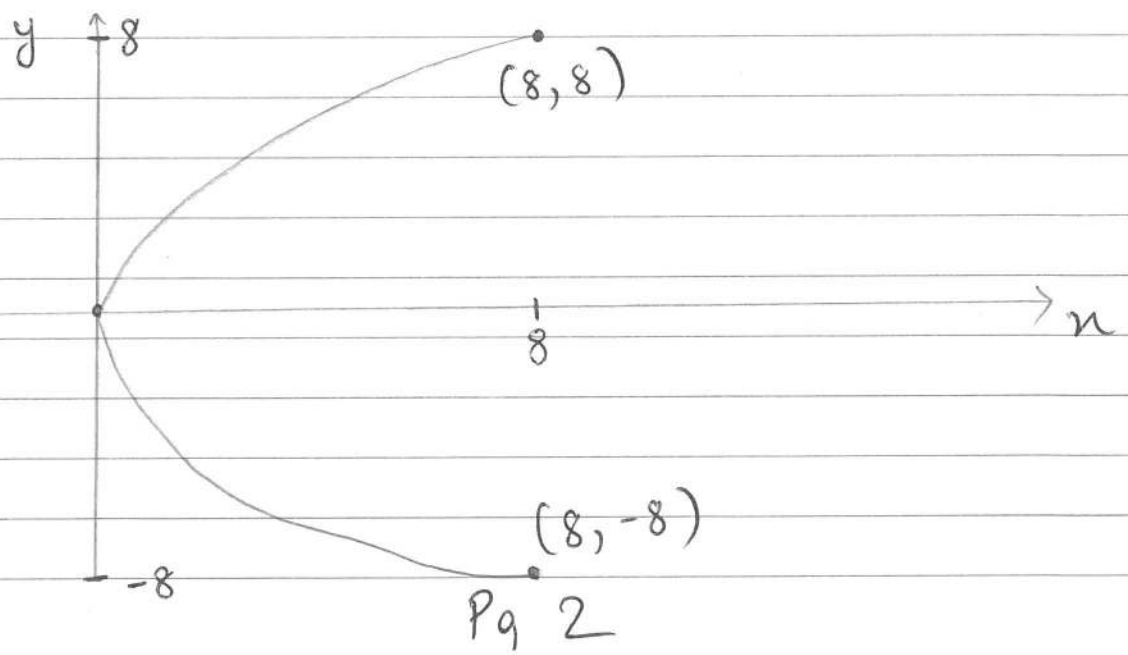
8.3 Curve Sketching

2] Cont.



3a) $x = 2t^2$, $y = 4t$, $-2 \leq t \leq 2$

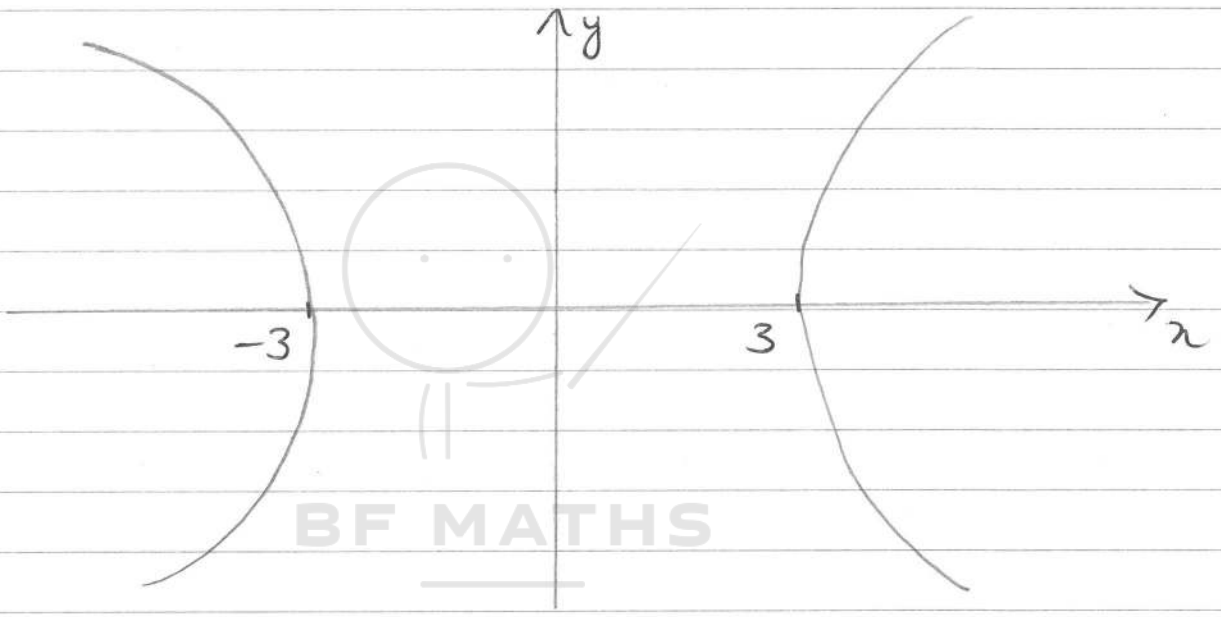
t	-2	-1	0	1	2
$x = 2t^2$	8	2	0	2	8
$y = 4t$	-8	-4	0	4	8



8.3 Curve Sketching

3b] $x = 3\operatorname{cosec} t$, $y = 3\cot t$, $0 \leq t \leq 2\pi$

t	0	$\pi/3$	π	$3\pi/2$	2π
$x = 3\operatorname{cosec} t$	Error	3	Error	-3	Error
$y = 3\cot t$	Error	Error	Error	Error	Error

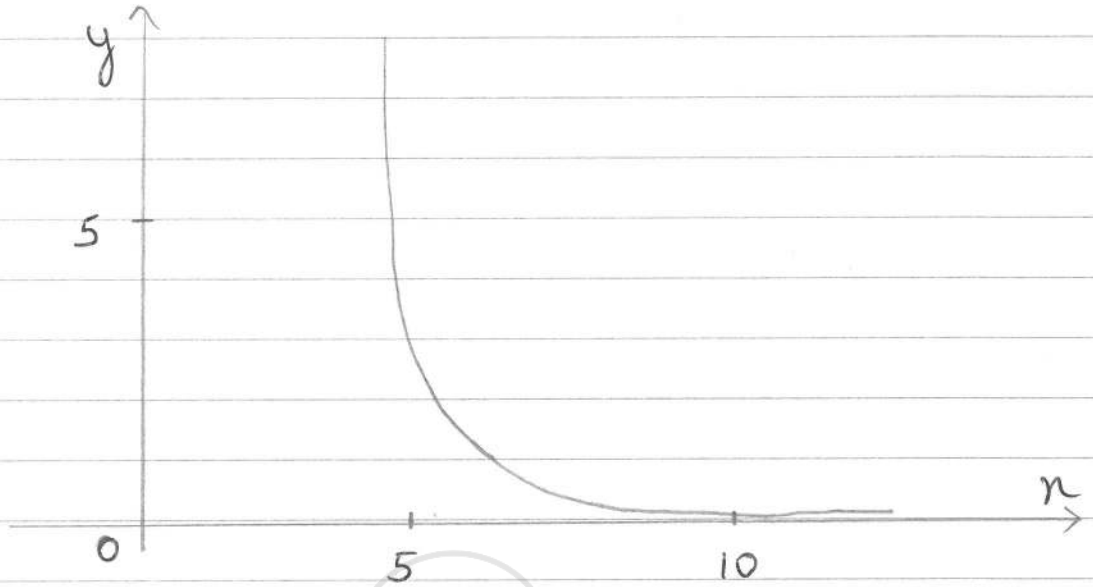


c] $x = t + 5$, $y = \frac{1}{t}$, $0 \leq t \leq 8$

t	0	1	2	3	4	5	6	7	8
$x = t + 5$	0	6	7	8	9	10	11	12	13
$y = \frac{1}{t}$	0	1	0.5	0.33	0.25	0.2	1.16	0.14	0.125

8.3 Curve Sketching

3c] Cont.



4a] $C_1 : x = 2t \qquad y = 2.5 - t$

$C_2 : x = \frac{1}{t} \qquad y = \frac{2}{t}$

$C_3 : x = 2t + 1 \qquad y = 12 - 6t$

$C_1 \Longrightarrow \quad t = \frac{x}{2}$

Sub t in y

$y = 2.5 - \frac{x}{2}$

$y = 2.5 - 0.5x$

Domain :

$1 \leq x \leq 5$

$C_2 \Longrightarrow \quad t = \frac{1}{x}$

Sub t in y

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

$y = 2x$

Domain :

$1 \leq x \leq 3$

8.3 Curve Sketching

4a] Cont.

$C_3 \Longrightarrow t = \frac{x-1}{2}$

Sub t in y

$y = 12 - 6\left(\frac{x-1}{2}\right)$

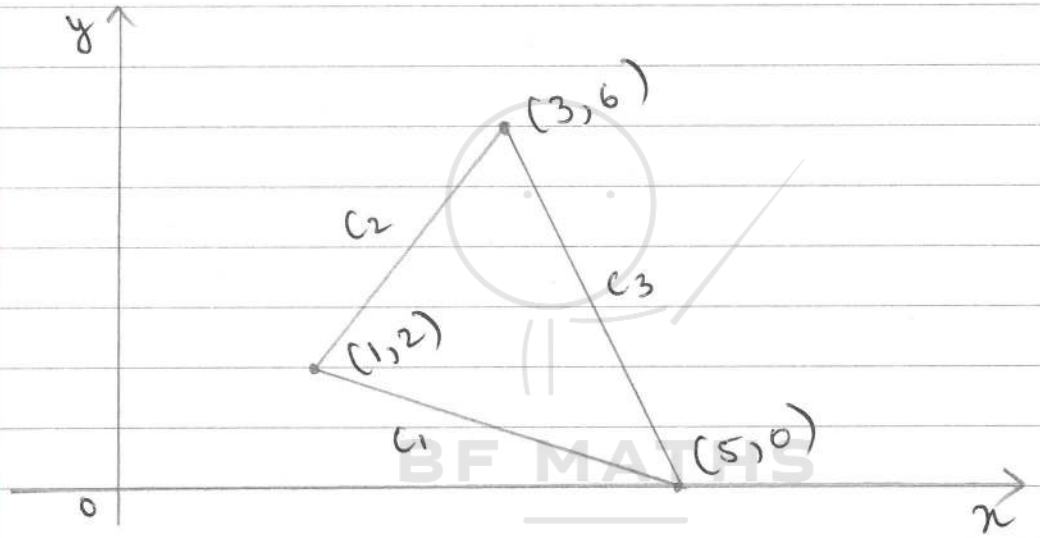
$y = 12 - 3x + 3$

$y = -3x + 15$

Domain:

$3 \leq x \leq 5$

b]



c] $\sqrt{4^2+2^2} = \sqrt{20}$

$\sqrt{2^2+4^2} = \sqrt{20}$

$\text{area} = \frac{1}{2} \times \sqrt{20} \times \sqrt{20}$

$\text{area} = 10$

8.3 Curve Sketching

5a] $x = t + 2$ $\qquad y = -5t - t^2$

$t = x - 2$

Sub t in y

$y = -5(x-2) - (x-2)^2$

$y = -5x + 10 - (x^2 - 4x + 4)$

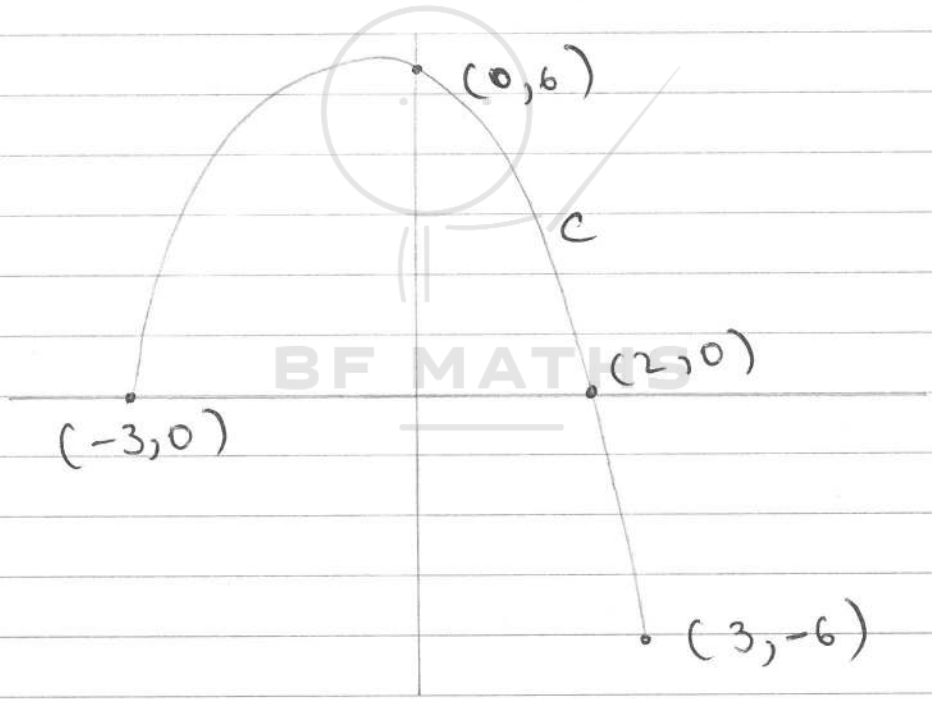
$y = -5x + 10 - x^2 + 4x - 4$

$y = -x^2 - x + 6$

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

Domain : $-3 \leq x \leq 3$

b]



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

$x = 2$, $x = -3$

Sub x-values in y

$y = 0$, $y = 0$

So the coordinates are $(-3,0)$ & $(2,0)$

8.3 Curve Sketching

5b] Cont.

When $x = 0$, $y = 6$

So the coordinates are $(0, 6)$

When $x = 3$, $y = -6$

So the coordinates are $(3, -6)$

6a] $x = 10\cos t + 3$ $\qquad$ $y = 10\sin t - 2$

$\frac{x-3}{10} = \cos t$ $\qquad$ $\frac{y+2}{10} = \sin t$

Using $\sin^2 t + \cos^2 t = 1$

$$\left(\frac{y+2}{10}\right)^2 + \left(\frac{x-3}{10}\right)^2 = 1$$

$$(y+2)^2 + (x-3)^2 = 100$$

b] Centre $(3, -2)$ radius $= 10$

When $x = 3$, $y = 8, -12$

$(3, 8)$ and $(3, -12)$

When $x = 13$, $y = -2$

So $(13, -2)$

$x = 10\cos t + 3$ $\qquad$ $y = 10\sin t - 2$

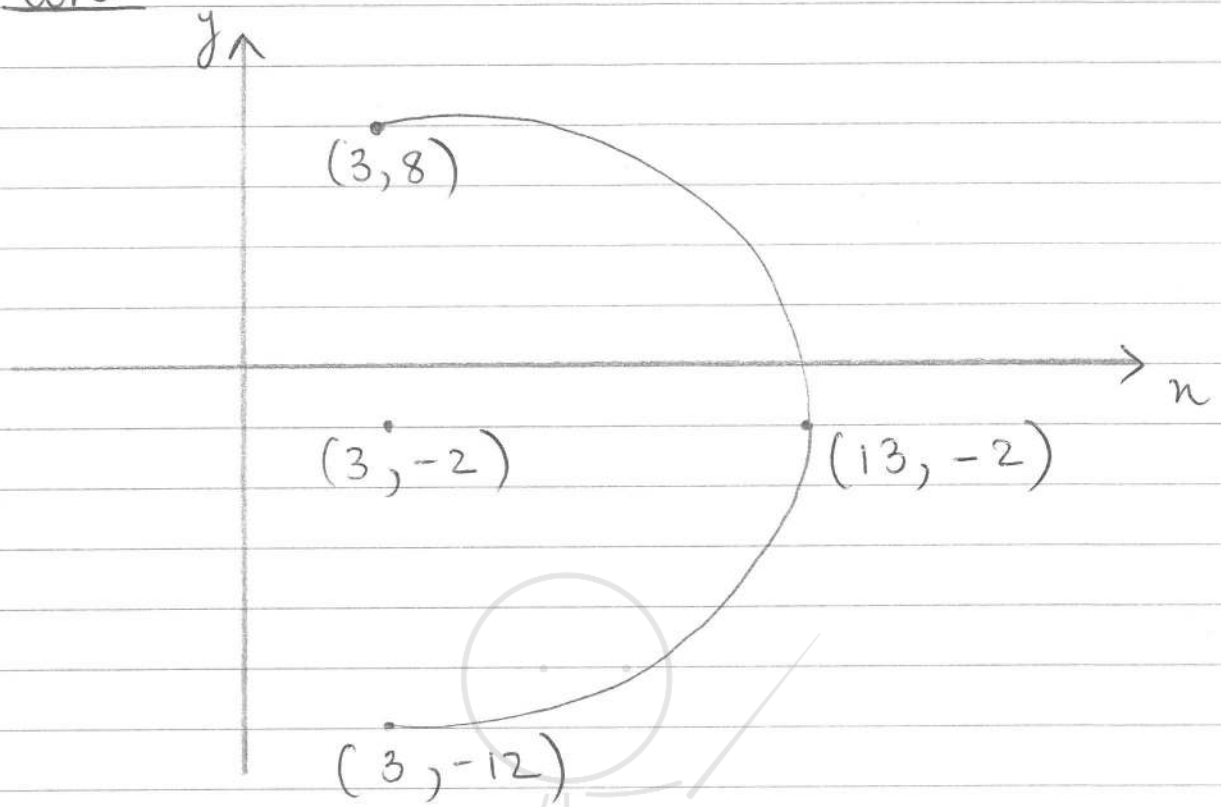
$t = -\frac{\pi}{2}$, $x = 3$ } Sub t values in x.

$t = \frac{\pi}{2}$, $x = 13$ }

$\therefore$ Domain $3 \leq x \leq 13$

8.3 Curve Sketching

6b] Cont.



* Since the domain is $3 \leq x \leq 13$ we cannot draw the whole circle as it lies outside the domain.
* So the curve is between 3 and 13.

c] Arc length $= r\theta$

$= (10)\pi$

$= 10\pi$