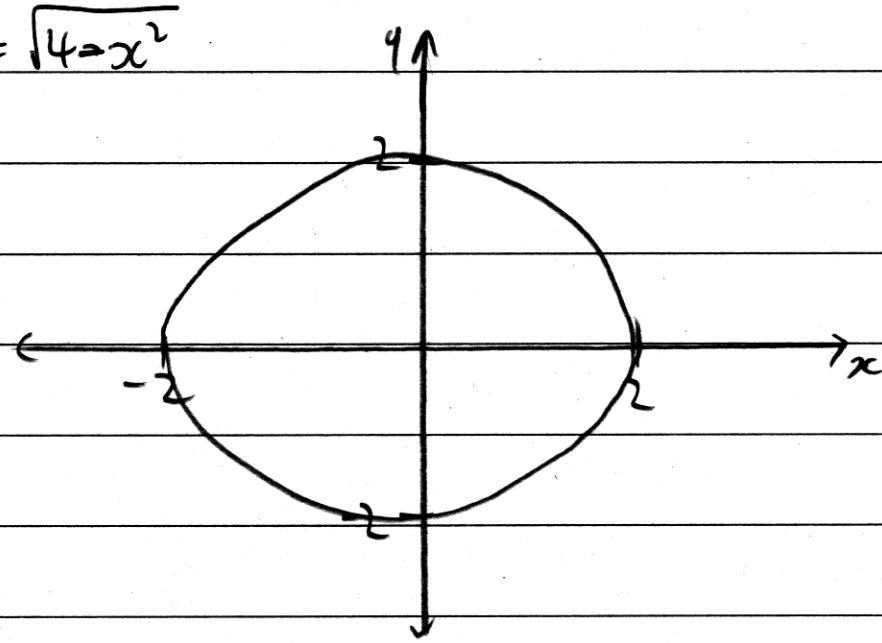
BOARD OF STUDIES
NEW SOUTH WALES

Question 6.

a.) $y = \sqrt{4-x^2}$



Range = $y \geq -2$ $y \leq 2$

$\therefore -2 \leq y \leq 2$.

b) $f'(x) = 3(x+1)(x-3)$. $y = f(x)$ pass point $(0,12)$.

(i) $y = f(x)$.

$\int (3(x+1)(x-3))\,dx$

$= \int (3x+3)(x-3)\,dx$

$= \int 3x^2 - 9x + 3x - 9\,dx$

$= \int 3x^2 - 6x - 9\,dx$.

$\therefore f(x) = x^3 - 3x^2 - 9x + c$. when $x=0$ $y=12$.

(ii) ~~y-intercept $y=0$ $0 = x^3 - 3x^2 - 9x + c$.~~

$\therefore 12 = 0^3 - 3(0)^2 - 9(0) + C$

$\therefore C = 12$.

$\therefore$ equation curve $= x^3 - 3x^2 - 9x + 12$.

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$f(x) = x^3 - 3x^2 - 9x + c$ through point $(0, 12)$.

$\therefore$ when $x = 0$ $y = 12$.

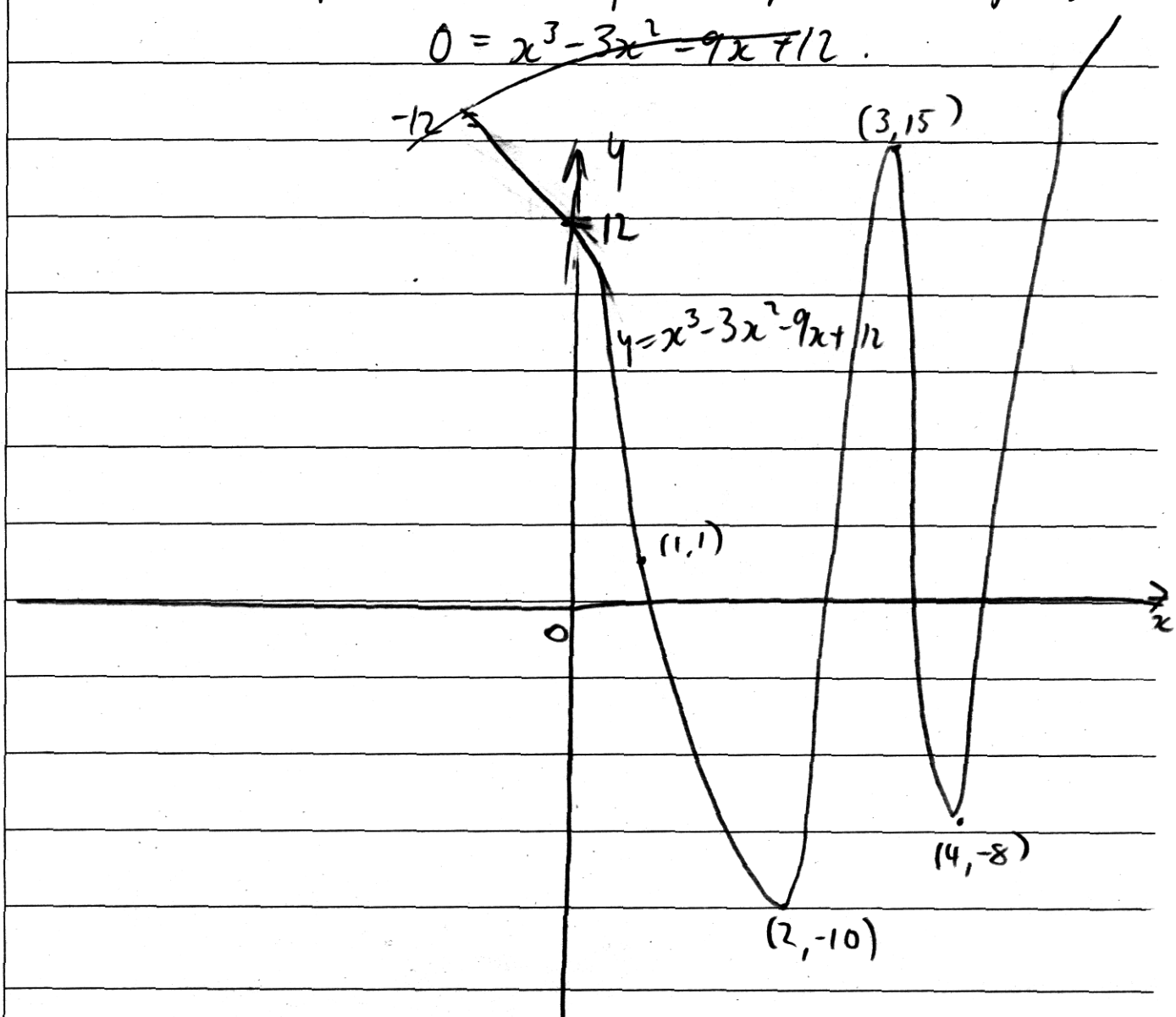
$\therefore 12 = 0^3 - 3(0)^2 + 9(0) + c$.

$\therefore c = 12$.

$\therefore$ equation: $y = x^3 - 3x^2 - 9x + 12$.

(ii) x intercept $= 12$. y-intercept (when $y = 0$)

$0 = x^3 - 3x^2 - 9x + 12$.



(iii) when $x=2$ and $x=4$ the curve is concave upwards.

c) $V = \pi \int y^2 dx$.

when $y = \frac{x^4}{4}$ between $x=0$ and $x=2$.

$$V = \pi \int \left(\frac{x^4}{4}\right)^2 dx.$$

$$= \pi \int \left(\frac{x^8}{16}\right) dx$$

$$= \pi \left[\frac{x^9}{144}\right]_0^2$$

$$= \pi \left(\frac{2^9}{144}\right) - \left(\frac{0^9}{144}\right)$$

$$= \pi \left(3\frac{5}{9} - 0 \right.$$

$$= 3\frac{5}{9}\pi.$$

$x^3 - 3x^2 - 9x + 12$

x	-3	-2	-1	0	1	2	3	4
y	-93		17	12	1	-10	15	-8

x	5	6	7	8	9	10	11
y	17	66	271	..	.	621	/

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