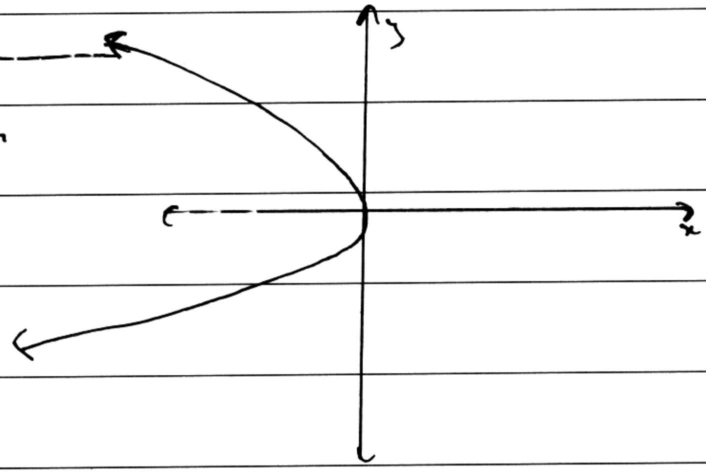
## Question 6

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

$= \sqrt{2} \times \sqrt{-x^2}$

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




range = all values of y

$y \geq 0$

b) $f'(x) = 3(x+1)(x-3)$. $f(x)$ passes thru $(0,12)$.

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

$f'(x) = 3(x^2 - 3x + x - 3)$

$f'(x) = 3x^2 - 6x - 9$

$f(x) = \int 3x^2 - 6x - 9$

$= x^3 - 6 + c$

∴ ~~the equation $y = f(x) = x^3 - 6 + 18$~~

~~$y = x^3 - 6 + c$~~

~~$12 = (0)^3 - 6 + c$~~

~~$12 = -6 + c$~~

~~$c = 18$~~

~~$y = x^3 - 6 + 18$~~

~~$x^3 - y - 6 + 18$~~

$f(x) = \int 3x^2 - 6x - 9$ Point $(0, 12)$.

$= x^3 - 3x^2 - 9x + C$

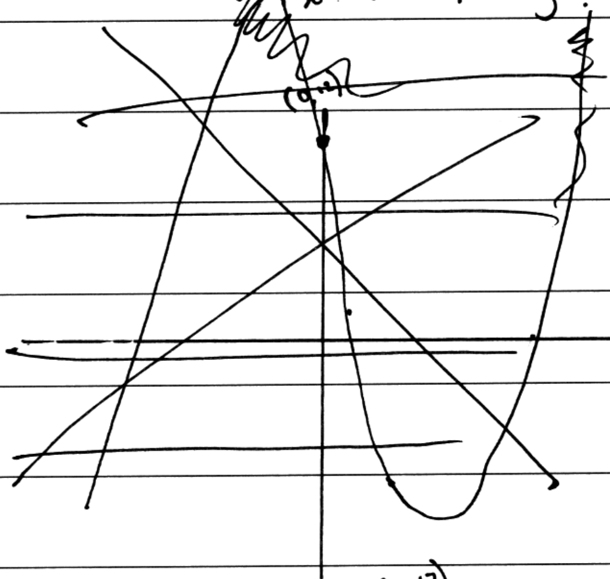
$12 = (0)^3 - 3(0)^2 - 9(0) + C$

$C = 12$ $\therefore$ equation of curve $y = f(x)$

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

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

(ii)



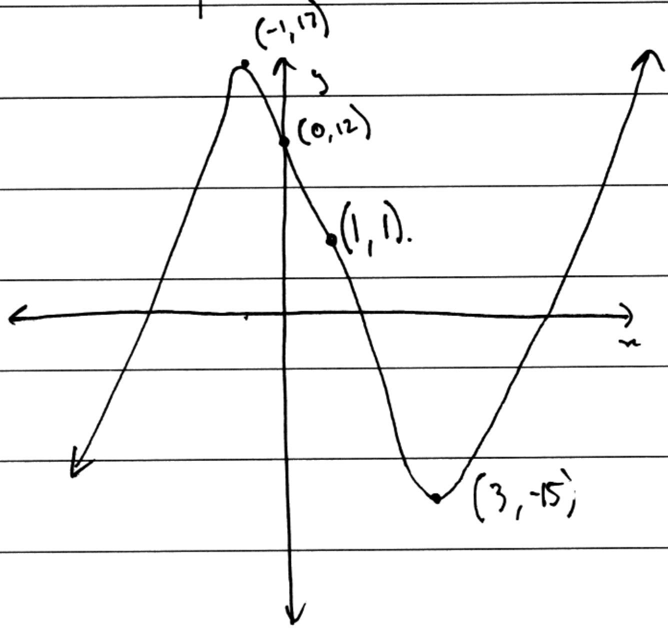

turning points occur when $\frac{dy}{dx} = 0$

$3(x+1)(x-3) = 0$

$3x^2 - 6x - 9 = 0$

$TP's = x = 3, -1$

TP's at $(-1, 17)$, $(3, -15)$.



(iii) $x$ is concave up for all values of $x \geq 1$

c) $V = \pi \int_0^2 \frac{y^4}{4}$ $\quad \frac{u}{v}$ $\qquad y = \frac{x^4}{4}$

$4y = x^4$

$x = \sqrt[4]{4y}$

$= \pi \int$