Question 6

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

$y = (4-x^2)^{1/2}$

$y = 2-x$

x	1	2	3	4	5	6
y	1	0	-1	-2	-3	-4

$y = \sqrt{4-x^2}$
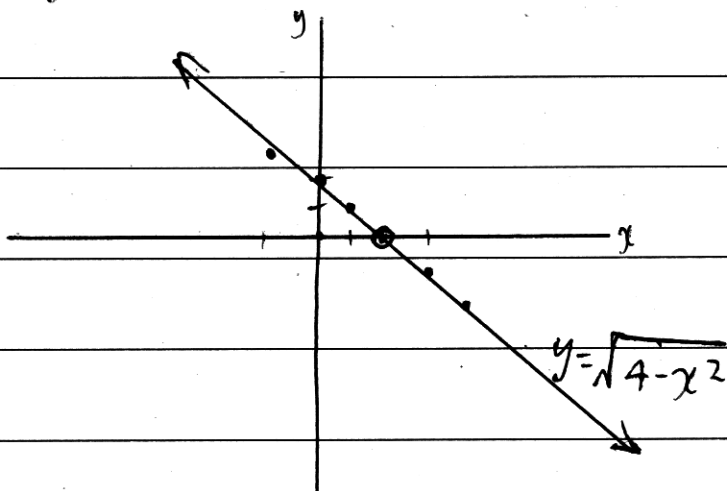
for all values of x except $x=2$.

$x \neq 2$

b) $f'(x) = 3(x+1)(x-3)$ let $f'(x) = 0$

$\quad = 3(x^2 - 2x - 3)$ ~~$0 = 3(x+1)(x-3)$~~

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

i) $f(x) = x^3 - 3x^2 - 9x$ $0 = 6x - 6$

ii) $x(x^2 - 3x - 9)$ $6x = 6$

~~$x(x \quad)(x \pm)$~~ $x = 1$ Stat point at $x=1$

let $f'(x) = 0$ ~~$f(x)$~~ Sub $x=1$ into y or $f(x)$

$0 = 3x^2 - 6x - 9$ $= 1^3 - 3(1)^2 - 9(1)$

$0 = x^2 - 2x - 3$ $= 1 - 3 - 9$

$x^2 - 2x = 3$ $= -11$ Inflexion at $(1, -11)$

~~$\dfrac{x^2}{2} - x = +5$~~

$f''(x) = 6x - 6$

$0 > 6x - 6$ (for maximum)

$6 > 6x$

$1 > x$

test $x = -2$ into $f(x)$

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

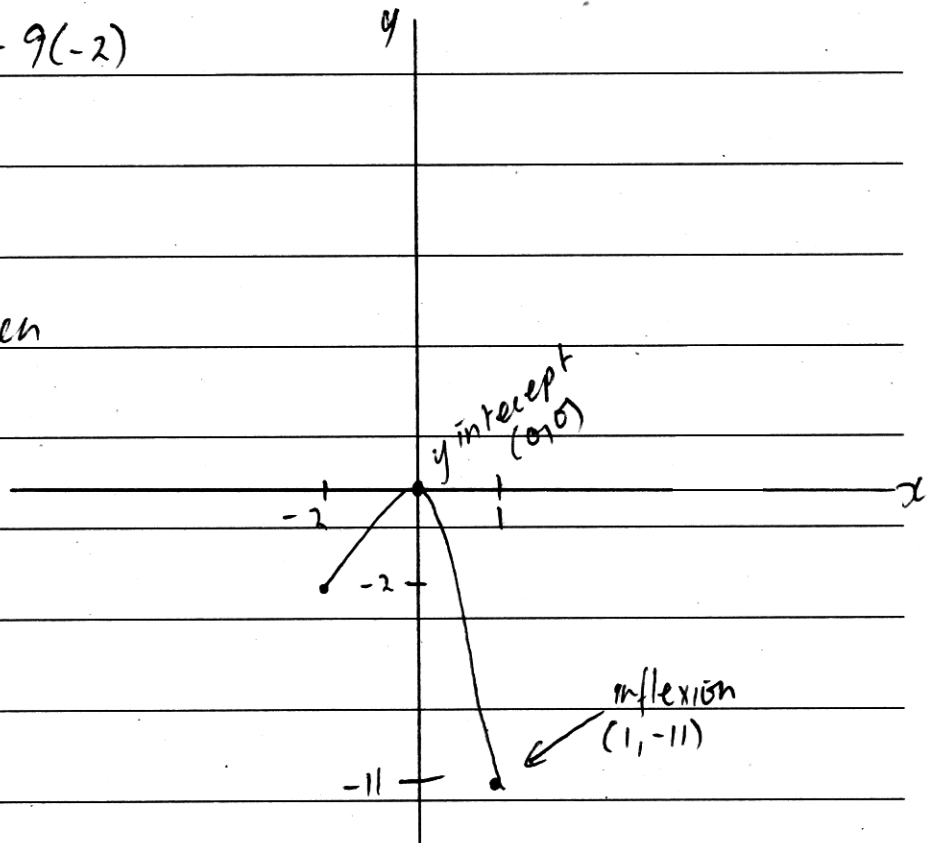$f(-2) = (-2)^3 - 3(-2)^2 - 9(-2)$

$= -8 - 12 + 18$

$= -2$

iii) Concave up when

$x > 1$

Graph: y-intercept (0,0), inflexion (1,-11), points at -2 on x-axis, -2 and -11 on y-axis marked.

c). $V = \pi \int_a^b x^2 \, dy$

$y = x^4$

$x^4 = 4y$ $V = \pi \int_0^2 2y$

$x^2 = 2y$ $V = \pi [2(2)] - 0$

$V = 4\pi$

$V = 12.57 \text{ units}^3$