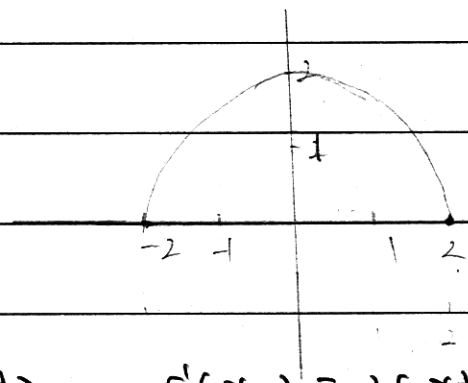
BOARD OF STUDIES
NEW SOUTH WALES

Question 6.

a)



$0 < y \leq 2$.

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

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

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

when $x = 0$ $f(x) = 12$ $C = 12$.

$f(x) = x^3 - 3x^2 - 9x + 12$.

ii) $f'(x) = 3(x+1)(x-3)$

stationary at $f'(x) = 0$

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

$x = -1 \quad x = 3$

$y = 17 \quad y = -15$

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

horizontal at $f''(x) = 0$

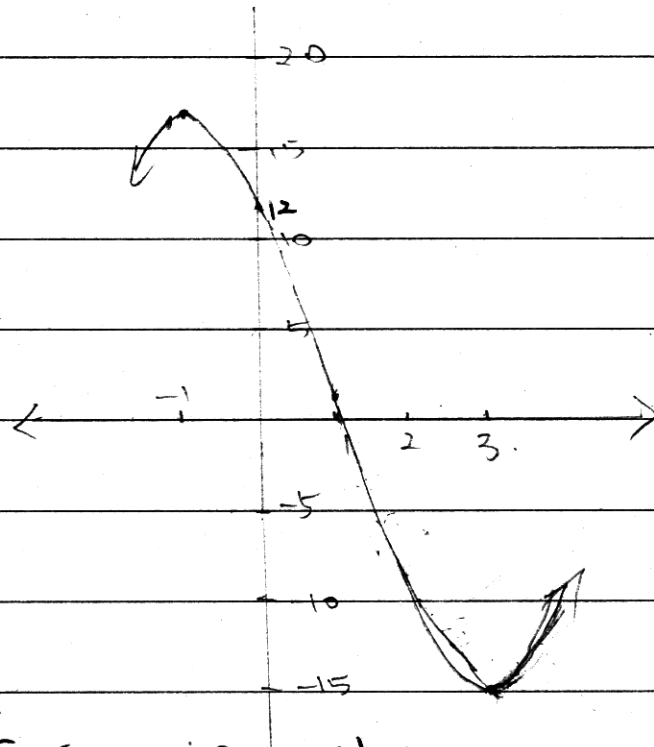
$6x - 6 = 0$

$x = 1$

$y = 1$

$x = -1$ $f''(x) < 0$ concave down

$x = 3$ $f''(x) > 0$ concave up.



iii) for $x = 3$ It is the minimum turning point the curve concave up.

c) ~~when x=0 y=0 when x=2 y=4~~

$\pi \int_0^2 y^2 \, dx$

$= \pi \int_0^2 \left(\frac{x^4}{4}\right)^2 dx$

$= \pi \left[\frac{1}{44} x^9\right]_0^2$

$= 11.\pi$ units^3. (to two decpla

$\pi \int_0^4 x^2 \, dy$

$= \pi \int_0^4 2 * y^{\frac{1}{2}} \, dy$

$= \pi \left[\frac{2}{3} y^{\frac{3}{2}}\right]_0^4 = 16.76$ units^3 (to two decpla