

MATH1100 - QUIZ 5

NAME: KEY

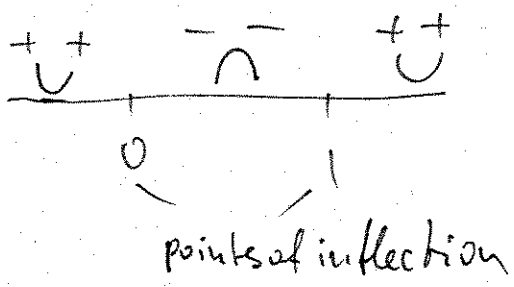
1. (7 points) Find the inflection points and the open intervals where the function

$$f(x) = \frac{x^4}{2} - x^3 + 5 \text{ is concave upward/downward.}$$

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

$$f''(x) = 6x^2 - 6x = 6x(x-1)$$

$$6x(x-1) = 0 \Rightarrow x = 0 ; x = 1$$



2. (8 points) A commodity has a revenue function modeled by $R(x) = 100x - 0.2x^3$

and a total cost function modeled by $C = 40x + 20$

a) What production level yields a maximum profit?

$$P(x) = R(x) - C(x) = 100x - 0.2x^3 - (40x + 20) = 60x - 0.2x^3 - 20$$

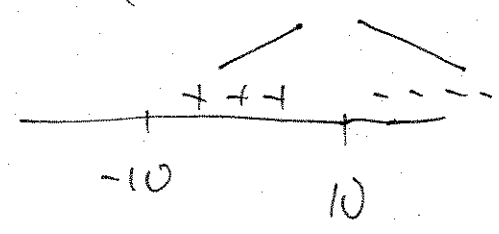
$$P'(x) = 60 - 0.6x^2$$

$$60 - 0.6x^2 = 0$$

$$0.6x^2 = 60$$

$$x^2 = 100$$

$$x = \pm 10$$



$\Rightarrow x = 10$ is a max. \Rightarrow

$\Rightarrow 10$ units will maximize the profit

b) When the profit is maximized, what is the average cost per unit (\bar{c})?

$$\bar{c}(x) = \frac{C(x)}{x} = \frac{40x + 20}{x} = \frac{40(10) + 20}{10} = \frac{420}{10} = 42 \text{ \$ / unit}$$