November 17, 2011

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 9B

Question 1. *(5 marks)* Find the intervals where the function $f(x) = x^3 - 3x + 4$ is increasing/decreasing.

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

$f'(x) = 0$

$3x^2 - 3 = 0$

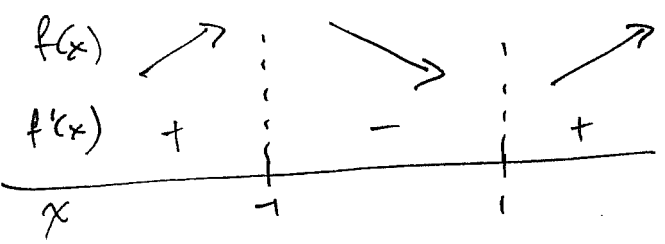
$3(x^2 - 1) = 0$

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

$x = \pm 1$

$f'(x)$ D.N.E.

POLYNOMIAL.



TEST POINTS

$x = -2$ $\quad f'(-2) = 3(-2)^2 - 3 = 9 > 0$

$x = 0$ $\quad f'(0) = 3(0)^2 - 3 = -3 < 0$

$x = 2$ $\quad f'(2) = 3(2)^2 - 3 = 9 > 0$

$\therefore$ f IS CONCAVE UPWARD ON $(-\infty, -1)$ AND $(1, \infty)$

f IS CONCAVE DOWNWARD ON $(-1, 1)$.

Question 2. *(5 marks)* Suppose the quantity demanded of Super Titan radial tires is related to the unit price by the equation

$$p + x^2 = 144$$

where x is measured in units of a thousand and p is in dollars. How fast is the quantity demanded changing when $x = 9$, $p = 63$, and the price/tire is increasing at the rate of \$2/week?

$\frac{d}{dt}(p) + \frac{d}{dt}(x^2) = \frac{d}{dt}[144]$

$\frac{dp}{dt} + 2x\frac{dx}{dt} = 0$

$2 + 2(9)\frac{dx}{dt} = 0$

$18\frac{dx}{dt} = -2$

$\frac{dx}{dt} = -\frac{2}{18} = -0.\overline{1}$

$x = 9, \quad p = 63$

$\frac{dp}{dt} = 2$

∴ THE QUANTITY DEMANDED IS DECREASING AT A RATE OF $\frac{1}{9}$ UNITS PER WEEK AT THE TIME IN QUESTION.