Dawson College: **Linear Algebra**: 201-NYA-05 13

November 11, 2010

Last Name: SOLUTIONS

First Name:

Student ID:

Quiz 2 (A)

Question 1. *(5 marks)* Find the first and sectond derivative of the function:

$f(t) = \frac{t}{t^2-1}$, $\quad f'(t) = \frac{(1)(t^2-1) - t(2t)}{(t^2-1)^2} = \frac{-t^2-1}{(t^2-1)^2}$

$$f''(t) = \frac{(-2t)(t^2-1)^2 - (-t^2-1)\left[2(t^2-1)(2t)\right]}{(t^2-1)^4}$$

$$= \frac{(2t)(t^2-1)\left[-(t^2-1) - (-t^2-1)(2)\right]}{(t^2-1)^4}$$

$$= \frac{(2t)\cancel{(t^2-1)}(t^2+3)}{(t^2-1)^{\cancel{4}\,3}} = \frac{2t(t^2+3)}{(t^2-1)^3}$$

Question 2. *(5 marks)* Find $\frac{dy}{dx}$:

$y^{1/2}x^2 = x + 2y^3$

$$\frac{d}{dx}(y^{1/2}x^2) = \frac{d}{dx}(x) + \frac{d}{dx}(2y^3)$$

$$\frac{1}{2}y^{-1/2}y'x^2 + y^{1/2}\cdot 2x = 1 + 6y^2y'$$

$$y'\frac{x^2}{2y^{1/2}} - 6y^2y' = 1 - 2y^{1/2}x$$

$$y'\left(\frac{x^2}{2y^{1/2}} - 6y^2\right) = 1 - 2y^{1/2}x$$

$$y'\left(\frac{x^2 - 12y^{5/2}}{2y^{1/2}}\right) = 1 - 2y^{1/2}x$$

$$y' = \frac{(1-2y^{1/2}x)(2y^{1/2})}{x^2 - 12y^{5/2}}$$

Question 3. *(5 marks)* Find the intervals where the function is increasing, the intervals where the function is decreasing and any relative extrema:

$$f(x) = \frac{10}{3}x^3 - 10x^2 - 30x - 10$$

$f'(x) = 10x^2 - 20x - 30$

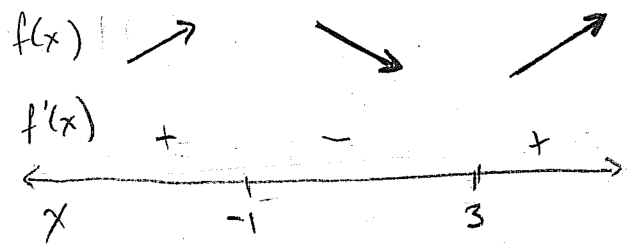
$f'(x) = 0$

$10x^2 - 20x - 30 = 0$

$10(x^2 - 2x - 3) = 0$

$10(x-3)(x+1) = 0$

$x = -1, 3$



TEST POINTS:

$x = -2$: $f'(-2) = 10(-2)^2 - 20(-2) - 30$

$= 40 + 40 - 30 = 50 > 0$

$x = 0$: $f'(0) = -30 < 0$

$x = 4$: $f'(4) = 10(4)^2 - 20(4) - 30$

$= 50 > 0$

$\therefore$ f IS INCREASING ON $(-\infty, -1)$ AND $(3, \infty)$

f IS DECREASING ON $(-1, 3)$.

$\therefore$ $f(-1) = \frac{10}{3}(-1)^3 - 10(-1)^2 - 30(-1) - 10 = \frac{20}{3}$ IS A RELATIVE MAXIMUM

$f(3) = \frac{10}{3}(3)^3 - 10(3)^2 - 30(3) - 10 = -100$ IS A RELATIVE MINIMUM