Dawson College: **Linear Algebra**: 201-NYA-05 15

November 11, 2010

Last Name: SOLUTION

First Name:

Student ID:

Quiz 2 (A)

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

$$f(t) = \frac{t^2-1}{t+1} \qquad f'(t) = \frac{2t(t+1) - (t^2-1)(1)}{(t+1)^2} = \frac{t^2+2t+1}{(t+1)^2}$$

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

$$= \frac{(t+1)[(2t+2)(t+1) - 2(t^2+2t+1)]}{(t+1)^2}$$

$$= \frac{(t+1)[2t^2+4t+1-2t^2-4t-1]}{(t+1)^2} = 0$$

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

$$4x + y^2 = \sqrt{xy}$$

CHAIN RULE.

$$\frac{d}{dx}(4x) + \frac{d}{dx}(y^2) = \frac{d}{dx}(xy)^{1/2}$$

$$4 + 2yy' = \frac{1}{2}(xy)^{-1/2}[y + xy']$$

$$4 + 2yy' = \frac{y+xy'}{2(xy)^{1/2}}$$

$$8(xy)^{1/2} + 4x^{1/2}y^{3/2}y' = y + xy'$$

$$4x^{1/2}y^{3/2}y' - xy' = y - 8(xy)^{1/2}$$

$$y'(4x^{1/2}y^{3/2} - x) = y - 8(xy)^{1/2}$$

$$y' = \frac{y - 8(xy)^{1/2}}{4x^{1/2}y^{3/2} - x}$$

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

$$f(x) = \frac{6}{3}x^3 - 6x^2 - 18x - 6$$

$f'(x) = 6x^2 - 12x - 18$ $\qquad$ $f'(x)$ IS DEFINED

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

$= 6(x-3)(x+1)$

$\therefore\ x = -1, 3$

$f(x)$	$\nearrow$		$\searrow$		$\nearrow$
$f'(x)$	$+$		$-$		$+$
x		-1		3	

TEST POINTS

$x = -2$: $f'(-2) = 6(-2)^2 - 12(-2) - 18 = 30 > 0$

$x = 0$: $f'(0) = -18 < 0$

$x = 4$: $f'(4) = 6(4)^2 - 12(4) - 18 = 30 > 0$

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

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

$\therefore$ $f(-1) = \frac{6}{3}(-1)^3 - 6(-1)^2 - 18(-1) - 6 = 4$ IS A RELATIVE MAXIMUM.

$f(3) = \frac{6}{3}(3)^3 - 6(3)^2 - 18(3) - 6 = -60$ IS A RELATIVE MINIMUM.