

Calculus 201-NYA-05 C3

Quiz 7

November 1, 2008

Name: SOLUTIONS
Student ID: _____

1. (5 marks). Find and classify the relative extrema of the function

$$f(x) = 2x^3 - 3x^2 - 36x + 14.$$

$$f'(x) = 6x^2 - 6x - 36 = 6(x^2 - x - 6) = 6(x-3)(x+2)$$

$f'(x) = 0 \Rightarrow x = 3, -2$, $f'(x)$ EXISTS FOR ALL REAL NUMBERS

INTERVAL	$-\infty < x < -2$	$-2 < x < 3$	$3 < x < \infty$
SIGN OF $f'(x)$	+	-	+
CONCLUSION	INCREASING	DECREASING	INCREASING

-2 3

$$\therefore f(-2) = 2(-2)^3 - 3(-2)^2 - 36(-2) + 14 = 58$$

\therefore RELATIVE MAXIMUM: $(-2, 58)$

$$f(3) = 2(3)^3 - 3(3)^2 - 36(3) + 14 = -67$$

\therefore RELATIVE MINIMUM AT $(3, -67)$

2. (5 marks). Find and classify the relative extrema of the function

$$f(x) = \frac{x^2}{x^2 - 9}$$

$$f'(x) = \frac{2x(x^2 - 9) - x^2(2x)}{(x^2 - 9)^2} = \frac{2x^3 - 18x - 2x^3}{(x^2 - 9)^2}$$

$$= \frac{-18x}{(x^2 - 9)^2}$$

$f'(x) = 0 \Rightarrow x = 0$, $f'(x)$ DOES NOT EXIST WHEN $(x^2 - 9)^2 = 0$

$$x^2 - 9 = 0$$

$$x^2 = 9$$

$$x = \pm 3$$

INTERVAL	$-\infty < x < -3$	$-3 < x < 0$	$0 < x < 3$	$3 < x < \infty$
SIGN OF $f'(x)$	+	+	-	-
CONCLUSION	INCREASING	INCREASING	DECREASING	DECREASING
	-3	0	3	
	↑	↑	↑	
	NOT RELATIVE MAX OR MIN.	RELATIVE MAX	NOT RELATIVE MAX OR MIN	

$\therefore f(0) = 0$

RELATIVE MAX (0, 0)

f IS INCREASING ON $(-\infty, -3)$ AND $(-3, 0)$
 AND DECREASING ON $(0, 3)$ AND $(3, \infty)$