Math 1A (9:30am – 10:20am)
Quiz 7
Fri Mar 5, 2010

SCORE: ___ / 20 POINTS

What month is your birthday ? ___ ___
What are the first 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___
[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]

NO CALCULATORS ALLOWED

Find the global maximum and minimum of $f(x) = 2x - 3x^{\frac{2}{3}}$ on $[-1, 3]$. **SCORE: ___ / 4 POINTS**

You may use the following approximations in your work.

x	2	3	4	5	6	7	8	9	10
$\sqrt[3]{x}$	1.3	1.4	1.6	1.7	1.8	1.9	2	2.1	2.2

$f'(x) = 2 - 2x^{-\frac{1}{3}}$ IS UNDEFINED @ $x = 0$ ($\frac{1}{2}$) $\in$ DOMAIN OF f ($\frac{1}{2}$)

$2 - 2x^{-\frac{1}{3}} = 0$

$x^{-\frac{1}{3}} = 1$

$x = 1$ (1)

	x	$f(x)$
$\frac{1}{4}$	-1	$-2-3 = -5$
$\frac{1}{4}$	0	0
$\frac{1}{4}$	1	$2-3 = -1$
$\frac{1}{4}$	3	$6 - 3\sqrt[3]{9} \approx -0.3$

GLOBAL MAX @ $x = 0$ ($\frac{1}{2}$)
MIN @ $x = -1$ ($\frac{1}{2}$)

$-\frac{1}{4}$ FOR EACH x OTHER THAN CRITICAL #'s AND ENDPOINTS

For the function $f(x) = \dfrac{1}{x-4}$ on the interval $[0, 3]$, find all values of c which satisfy the conclusion of the Mean Value Theorem. **SCORE: ___ / 3 POINTS**

$f'(x) = -\dfrac{1}{(x-4)^2}$

$\dfrac{f(3) - f(0)}{3 - 0} = \dfrac{-1 - -\frac{1}{4}}{3} = \dfrac{-\frac{3}{4}}{3} = -\dfrac{1}{4}$

(1) $-\dfrac{1}{(c-4)^2} = -\dfrac{1}{4}$ (1)

$(c-4)^2 = 4$

$c - 4 = \pm 2$

$c = 4 \pm 2 = 6$ OR 2

$-\frac{1}{2}$ IF YOU ALSO SAID $c = 6$ → (1) $c = 2 \in (0, 3)$

FOR ALL REMAINING QUESTIONS, YOU WILL BE GIVEN INFORMATION ABOUT f' OR f'' BUT YOU MUST ANSWER QUESTIONS ABOUT f.

The second derivative of a polynomial f is $f''(x) = 3x^2 - 6x$. The critical numbers of f are -1 and 2. **SCORE: ___ / 4 POINTS**

[a] What does the Second Derivative Test tell you about each critical number above ?

$f''(-1) = 3+6 = 9 > 0$ LOCAL MIN $\frac{1}{2}$ $\frac{1}{2}$

$f''(2) = 12-12 = 0$ $\frac{1}{2}$ NO CONCLUSION $\frac{1}{2}$

[b] Find all intervals over which f is concave up.

$f''(x) = 3x(x-2) = 0$ @ $x = 0, 2$ $\frac{1}{2}$

f'' : + (−∞, 0) − (0, 2) + (2, ∞) $\frac{1}{2}$

$3x$: − (−∞, 0) + (0, ∞)

$x-2$: − (−∞, 2) + (2, ∞)

f IS CONC UP ON $(-\infty, 0)$ $\frac{1}{2}$ AND $(2, \infty)$ $\frac{1}{2}$

The derivative of a function f is $f'(x) = \dfrac{(x+2)^4}{\sqrt[3]{x}}$. f is continuous on $(-\infty, \infty)$. **SCORE: ___ / 3 POINTS**

[a] Find the critical numbers of f.

$f' = 0$ @ $x = -2$ $\frac{3}{4}$

f' UNDEFINED @ $x = 0$ $\frac{3}{4}$

[b] Using the First Derivative Test, determine if each critical number is a local maximum or local minimum or neither.

f' : − (−∞, −2) − (−2, 0) + (0, ∞) $\frac{1}{2}$

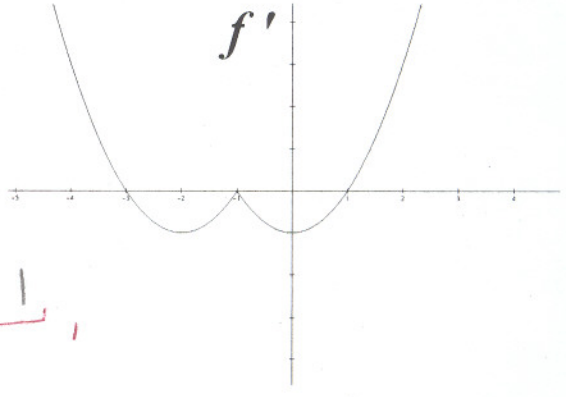
$(x+2)^4$: + (−∞, ∞)

$\sqrt[3]{x}$: − (−∞, 0) + (0, ∞)

$x = 0$ IS LOCAL MIN, $\frac{1}{2}$

$x = -2$ IS NEITHER, $\frac{1}{2}$

The graph of the derivative f' of a continuous function f is given on the right. **SCORE: ___ / 6 POINTS**



[1] Find the critical numbers of f. Give a brief explanation of your answer.

$f' = 0$ @ $x = -3, -1, 1$ 1

f' IS NEVER UNDEFINED 1

[2] Find the x-coordinates of all local minima of f.
Give a brief explanation of your answer.

f' CHANGES FROM − TO + @ $x = 1$ 1 1

[3] Find all intervals over which f is concave down.
Give a brief explanation of your answer.

f' IS DECREASING ON $(-\infty, -2)$ AND $(-1, 0)$ 1 1