Math 1A (10:30am – 11:20am)
Quiz 7 Version B
Fri Mar 4, 2011

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 DeAnza ID number ? ___ ___

SCORE: ___ / 30 POINTS

NO CALCULATORS ALLOWED

SHOW PROPER ALGEBRAIC WORK AND USE PROPER NOTATION

State the definition of "concave up". **SCORE: ___ / 2 POINTS**

f IS CONCAVE UP ON (a,b)
IF f' IS INCREASING ON (a,b)

State the Mean Value Theorem. **SCORE: ___ / 2 POINTS**

IF f IS CONTINUOUS ON [a,b] AND DIFFERENTIABLE ON (a,b)
THEN THERE EXISTS A VALUE $c \in (a,b)$ SUCH THAT $f'(c) = \frac{f(b)-f(a)}{b-a}$

Let $f(x) = 2 - 15x^4 - 3x^5$. **SCORE: ___ / 10 POINTS**

[a] Find all critical numbers of f.

$f'(x) = -60x^3 - 15x^4$,

$= -15x^3(4+x) = 0$ @ $x = 0, -4$

[b] For each critical number, determine what the Second Derivative Test tells you about that critical number.

$f''(x) = -180x^2 - 60x^3$,

$= -60x^2(3+x)$

½ $f''(0) = 0$ → NO CONCLUSION ,

½ $f''(-4) > 0$ → LOCAL MIN @ $x = -4$,

[c] Find the inflection points of f.

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

f'' : + (−∞, −3) | − (−3, 0) | − (0, ∞) ½

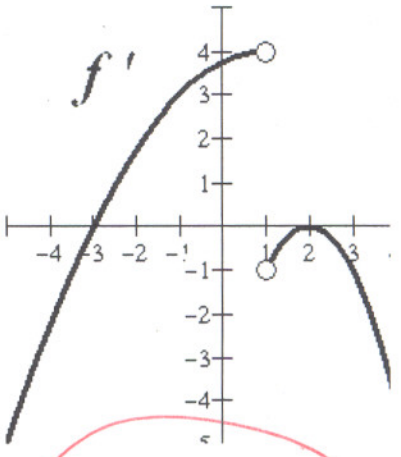
I.P. @ $x = -3$, ½

	−3	0
$-60x^2$	−	−
$3+x$	−	+

NO POINTS IF YOU SAID BOTH $x = 0, -3$

The graph of the derivative f' of a **continuous** function f is shown on the right.

SCORE: ___ / 10 POINTS



[a] Write "**OK**" if you understand that the graph shows f' and **NOT** f, but that all the questions below are about f and **NOT** f', and that you must explain your answers to get any credit.

OK

[b] Is f increasing or decreasing on the interval $[-5, -3]$? Explain your answer(s) **very briefly**.

$f' < 0 \rightarrow f$ DECREASING

[c] Find the x – coordinates of all critical numbers of f. Explain your answer(s) **very briefly**.

$f' = 0$ @ $x = -3, 2$ $\quad f'$ DNE @ $x = 1$

1 POINT EACH

[d] Find the x – coordinates of all local maxima of f. Explain your answer(s) **very briefly**.

f' CHANGES FROM POSITIVE TO NEGATIVE @ $x = 1$

[e] Is f concave up or down on the interval $[-3, 0]$? Explain your answer(s) **very briefly**.

f' INCREASING $\rightarrow$ f CONCAVE UP

[f] Find the x – coordinates of all inflection points of f. Explain your answer(s) **very briefly**.

f' CHANGES FROM INCREASING TO DECREASING @ $x = 2$

Does Rolle's Theorem apply to the function $f(x) = \sqrt[3]{x} - \frac{x}{9}$ on the interval $[-27, 27]$?

SCORE: ___ / 3 POINTS

If yes, find the value of c guaranteed by Rolle's Theorem. If no, explain why not.

$f'(x) = \frac{1}{3}x^{-\frac{2}{3}} - \frac{1}{9}$ DNE @ $x = 0$ $\quad \frac{1}{2}$ $\quad \frac{1}{2}$

f IS NOT DIFFERENTIABLE ON $[-27, 27]$ $\quad 1$

SO, ROLLE'S THEOREM DOES NOT APPLY $\quad 1$

Sketch the graph of a **continuous** function that satisfies all the given conditions.

SCORE: ___ / 3 POINTS

$f'(x) < 0$ if $x < 2$,
$f'(x) > 0$ if $x > 2$,
$f''(x) > 0$ if $|x| > 2$,
$f''(x) < 0$ if $|x| < 2$