Math 131 - Quiz 9

April 3, 2023

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (4 points) Recall that a *critical number* of a function f is an interior point (not a boundary point) in the domain of f at which the derivative is zero or not defined. Let $f(x) = \frac{1}{4}x^4 - \frac{1}{3}x^3 - 3x^2$ for $0 \le x \le 4$. Find all critical numbers of f.

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

$= x(x-3)(x+2) = 0$

$x = 0, x = 3, x = -2$

↑ END PT ↑ CRIT ↑ NOT IN DOMAIN

$f'(x)$ DNE NOWHERE

THE ONLY CRIT # IS $x = 3$

2. (3 points) The function f is the same function as in problem #1:

$$f(x) = \frac{1}{4}x^4 - \frac{1}{3}x^3 - 3x^2 \text{ for } 0 \le x \le 4.$$

Use calculus techniques to find the absolute maximum and minimum values of f on $[0, 4]$. (Do not repeat any of the work you did above.)

CRIT #: $x = 3$

END PTS: $x = 0, x = 4$

x	$f(x)$	
3	-15.75	← ABS MIN
0	0	← ABS MAX
4	$-5.\overline{3}$	

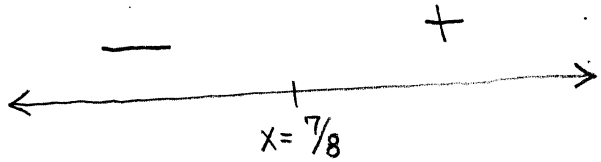
3. (3 points) Use calculus techniques to find open intervals on which $g(x) = 4x^2 - 7x + 3$ is increasing/decreasing.

$g'(x) = 8x - 7$

$g'(x) = 0 \Rightarrow x = \frac{7}{8}$

↑ ONLY CRIT #.

SIGNS OF g'



g IS DEC INC.

g IS DECREASING ON $(-\infty, 7/8)$

g IS INCREASING ON $(7/8, \infty)$