

Math 131 - Quiz 9

April 5, 2023

Name key

Score _____

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

1. (3 points) Let $f(x) = \frac{1}{4}x^4 - \frac{1}{3}x^3 - 3x^2$ for $0 \leq x \leq 4$. Find all critical numbers of f .

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

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

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

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

THE ONLY SUCH DOMAIN INTERIOR
PT IS

$$x=3$$

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

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

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 #: $x=3$

Endpts: $x=0, x=4$

x	f(x)
3	$-63/4$ ← ABS MIN
0	0 ← ABS MAX
4	$-16/3$

3. (5 points) Use calculus techniques to find open intervals on which $g(x) = x^5 - 10x^4 + 25x^3$ is increasing/decreasing. Also identify all relative extreme values.

$$g'(x) = 5x^4 - 40x^3 + 75x^2$$

$$= 5x^2(x^2 - 8x + 15)$$

$$= 5x^2(x-3)(x-5) = 0$$

$$x=0, x=3, x=5$$

g IS INCREASING ON
 $(-\infty, 0) \cup (0, 3) \cup (5, \infty)$

g IS DECREASING ON $(3, 5)$

$g(3) = 108$ IS A REL MAX.

$g(5) = 0$ IS A REL. MIN.

