Math 131 - Quiz 9
November 2, 2022

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary. This quiz is due November 7.

1. (2 points) Determine the critical numbers of $f(x) = 5x^{2/3} + x^{5/3}$.

f IS DEFINED FOR ALL REAL #'S.

$$f'(x) = \frac{10}{3}x^{-1/3} + \frac{5}{3}x^{2/3}$$

$$= \frac{5}{3}x^{-1/3}(2 + x)$$

$$= \frac{5(2+x)}{3\sqrt[3]{x}}$$

$f'(x) = 0 \Rightarrow x = -2$

$f'(x)$ DNE $\Rightarrow x = 0$

2. (3 points) Use calculus techniques to find the absolute minimum and maximum values of $f(x) = e^{4x-x^2}$ on the interval $[1, 4]$.

$$f'(x) = (4-2x)e^{4x-x^2} = 0 \Rightarrow x = 2$$

$x = 2$ IS THE ONLY CRIT #.

END PTS ARE $x = 1$, $x = 4$

x	$f(x)$
2	e^4 ← ABS MAX
1	e^3
4	1 ← ABS MIN

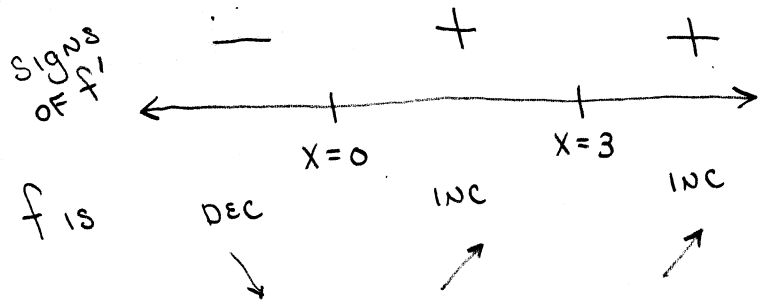
Turn over.

3. (5 points) Let $f(x) = x^4 - 8x^3 + 18x^2 - 11$. Use calculus to find open intervals on which f is increasing/decreasing. Also find all relative extreme values.

$$f'(x) = 4x^3 - 24x^2 + 36x$$
$$= 4x(x^2 - 6x + 9)$$
$$= 4x(x-3)^2$$

$f'(x) = 0 \Rightarrow x = 0, x = 3$

$f'(x)$ DNE NOWHERE.



f IS DECREASING ON $(-\infty, 0)$.

f IS INCREASING ON $(0,3) \cup (3,\infty)$.

$f(0) = -11$ IS A REL. MIN.

$f(3)$ IS NEITHER A MAX NOR A MIN.