Math 251: Quiz 7 SOLUTIONS **October 30, 2018**

Name: ______________________ ________ / 25

Instructor: **Bueler | Jurkowski | Maxwell**

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. **[4 points]** Find all critical numbers (a.k.a. critical points) of the function $f(x) = \sqrt[5]{x^2-4}$. Be careful!

[the domain of f is $(-\infty,\infty)$ because $z^{1/5}$ always makes sense]

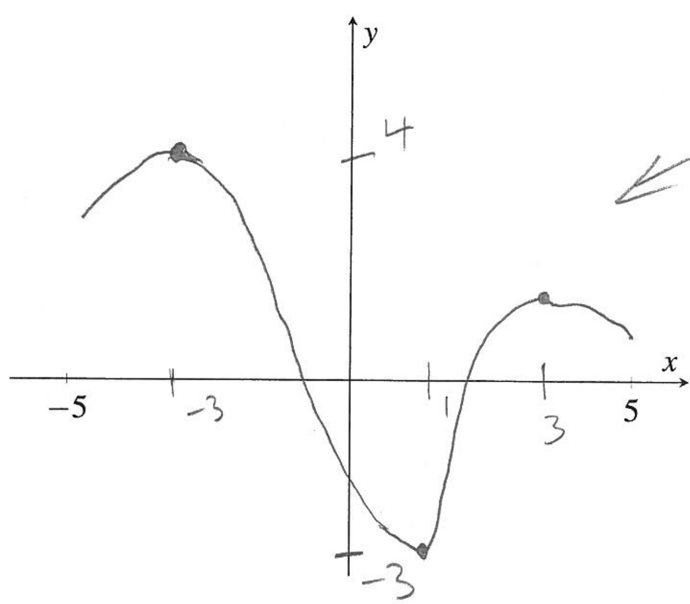
$$f'(x) = \frac{1}{5}(x^2-4)^{-4/5}(2x) = \frac{2x}{5(x^2-4)^{4/5}}$$

$$f'(x) = 0 \iff x = 0$$

$$f'(x) \text{ d.n.e.} \iff x = \pm 2$$

critical #s at $x = -2, 0, +2$

2. **[5 points]** Sketch a function on $[-5,5]$ that has an absolute maximum value of 4 at $x = -3$, an absolute minimum value of -3 at $x = 1$, and a local maximum at $x = 3$. You should appropriately label notable values on the x- and y-axes for full credit.



one possibility

3. [8 points] Find the maximum and minimum values of the function $f(x) = 4x + \frac{1}{x}$ on the interval $[1/5, 1]$.

$f'(x) = 4 - \frac{1}{x^2} = 0$

$4 = \frac{1}{x^2}$

$x = \pm \frac{1}{2}$

ignore $-\frac{1}{2}$

x	$f(x)$
$\frac{1}{5}$	$\frac{4}{5} + 5 = 5.8$
$\frac{1}{2}$	$2 + 2 = 4$
1	5

absolute max @ $f(\frac{1}{5}) = 5.8$

absolute min @ $f(\frac{1}{2}) = 4$

4. [8 points] Suppose f is continuous on $[-2, 2]$ and has a derivative at each point in $(-2, 2)$. Suppose $f(-2) = 4$ and $f(2) = -6$.

a. What specifically does the Mean Value Theorem let you conclude?

there is c in $(-2, 2)$ so that

$$f'(c) = \frac{f(2) - f(-2)}{2 - (-2)} = \frac{-6 - 4}{4} = -\frac{5}{2}$$

b. Draw a diagram that illustrates the Mean Value Theorem for this problem. Your illustration should include a tangent line somewhere.