Circle your Instructor:
Faudree, Williams, Zirbes

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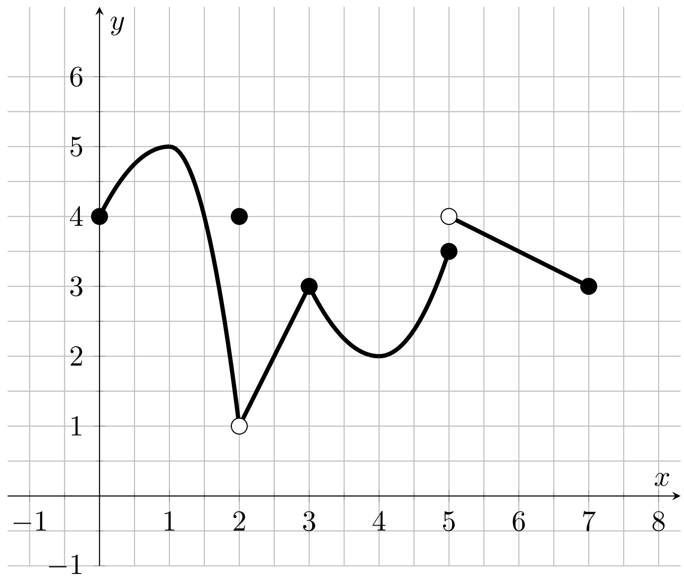
Math 251 Fall 2017 **Quiz #8, November 1st**

Name: Solution

There are 23 points possible on this quiz. This is a closed book quiz. Calculators and notes are not allowed. **Please show all of your work!** If you have any questions, please raise your hand.

Exercise 1. (8 pts.) Consider the graph of the function f given below.



a) State the absolute maximum of the function f on the interval $[0, 6]$ and give its location or explain why it doesn't exist.

5 at $x = 1$

b) State the absolute minimum of the function f on the interval $[0, 6]$ and give its location or explain why it doesn't exist.

None, approaches $y=1$ at $x=2$, but doesn't reach it.

c) Identify any other local maxima of the function f and their locations.

4 at $x=2$, 3 at $x=3$

d) Identify any other local minima of the function f and their locations.

4 at $x=0$, 2 at $x=4$, 3 at $x=7$

Exercise 2. (5 pts.) Find the absolute maximum and absolute minimum of the function

$$f(x) = -2x^3 + 3x^2 + 12x$$

on the interval $[0, 3]$.

$f'(x) = -6x^2 + 6x + 12 = -6(x^2 - x - 2)$
$= -6(x-2)(x+1)$

So critical point at $x=2$ in $[0,3]$

$f(0) = 0$

$f(2) = -16 + 12 + 24 = 20$

$f(3) = -54 + 27 + 36 = 36 - 27 = 9$

So absolute maximum is 20
absolute minimum is 0.

Exercise 3. (5 pts.) Find the critical numbers of the function $F(x) = x^{2/5}(x-5)$.

$F(x) = x^{7/5} - 5x^{2/5}$

$F'(x) = \frac{7}{5}x^{2/5} - \frac{10}{5}x^{-3/5} = \frac{x^{-3/5}}{5}(7x - 10)$

So critical points at $x=0$ and $x = \frac{10}{7}$.

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Exercise 4. (5 pts.) Consider the function $f(x) = 2x^2 - 3x + 1$ on the interval $[0, 2]$.

a) Verify that the function satisfies the hypotheses of the Mean Value Theorem on the interval $[0, 2]$. Justify your answer in words.

$f(x)$ is a polynomial so it is continuous and differentiable on $[0,2]$.

b) Find all numbers c in the interval $[0, 2]$ that satisfy the conclusion of the Mean Value Theorem.

$$m = \frac{f(2) - f(0)}{2} = \frac{8-6+1-1}{2} = 1$$

$$f'(x) = 4x - 3$$

$$4x - 3 = 1$$
$$4x = 4$$
$$x = 1$$

$$\boxed{\text{so } c = 1}$$