

Name: \_\_\_\_\_

**Math 1300-005 - Spring 2017**

Quiz 10 - 3/24/17

*On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work.*

Signature: \_\_\_\_\_

*Guidelines:* You are permitted to use notes, the book, in-class worksheets/solutions, and your classmates on this quiz. Computers and graphing technology of any kind, including calculators, are not allowed (exceptions made for those who have an e-book). Please show all work and clearly denote your answer.

1. Consider the function  $f(x) = x^2 - 5x + 7$  on  $[-1, 3]$ .
  - (a) Does  $f$  satisfy the hypotheses of the MVT on  $[-1, 3]$ ? Explain your answer.
  
  
  
  
  
  
  
  
  
  
  - (b) Find all numbers  $c$  that satisfy the conclusion of the MVT for  $f$  on  $[-1, 3]$ .
  
  
  
  
  
  
  
  
  
  
2. Using the same function  $f$  as in question 1, find the absolute maximum and absolute minimum values of  $f$  on  $[-1, 3]$ . At what  $x$ -value(s) do the max and min occur?

3. Consider the function  $f(x)$  and its first and second derivatives.

$$f(x) = \frac{3x(x-4)}{(x+2)^2}, \quad f'(x) = \frac{24(x-1)}{(x+2)^3}, \quad f''(x) = \frac{-24(2x-5)}{(x+2)^4}$$

- (a) Find the  $x$ -intercept(s) of  $f$ , if any. Find the  $y$ -intercept(s) of  $f$ , if any.
- (b) Find the vertical asymptote(s) of  $f$ , if any. Find the horizontal asymptote(s) of  $f$ , if any.
- (c) Find all values of  $x$  such that  $f'(x) = 0$  **AND** all values of  $x$  such that the denominator of  $f'$  is zero. Which of these  $x$ -values are critical numbers?
- (d) Plot *all* values from (c) on a sign chart for  $f'$ . If an  $x$ -value is critical, place it on the sign chart with a solid dot. If an  $x$ -value is not critical, place it on the sign chart with an open dot. Fill in your sign chart using test points.
- (e) Find the intervals of increase or decrease for  $f$ . Justify your answer.
- (f) Find the  $x$ -coordinates and  $y$ -coordinates of the local maximum and minimum values of  $f$ . Justify your answer.

- (g) Find all values of  $x$  such that  $f''(x) = 0$  **AND** all values of  $x$  such that the denominator of  $f''$  is zero.
- (h) Plot all values from (g) on a sign chart for  $f''$ . If an  $x$ -value is in the domain of  $f$ , place it on the sign chart with a solid dot. If an  $x$ -value is not in the domain of  $f$ , place it on the sign chart with an open dot. Fill in your sign chart using test points.
- (i) Find the intervals of concavity for  $f$ . Justify your answer.
- (j) Find the  $x$ -coordinates and  $y$ -coordinates of any inflection points of  $f$ . To save time,  $f(5/2) = -5/9$ . Justify your answer.
- (k) Using all the information from parts (a) through (j), sketch a graph of  $f(x)$  below.

