Exam #1

September 13, 2018

Name _____

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.

- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.

- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who opens a cell phone during the examination or if one is found on their seat or hand.

No calculators are allowed!

Honor Code: On my honor, I have neither received nor given any aid during this examination.

Signature: _____

1. Evaluate the following limits algebraically, if they exist:

a) $\lim\limits_{x \to 4} \dfrac{x - 4}{\sqrt{x} - 2}$

b) $\lim\limits_{x \to 6} \dfrac{x^2 - 36}{x - 6}$

c) $\lim\limits_{x \to \infty} \dfrac{2x^2 - 3x + 5}{x + 1}$

d) $\lim\limits_{x \to -\infty} \dfrac{2x - 4}{x^3 - 5x^2 + 1}$

2. Give an example (can be a graph) of a function that is continuous at a number but not differentiable at this number.

3. Find the derivative of the function using the **definition of derivative**. [You will get no credit for using the power rule for differentiation.]

$$f(x) = x^2 - 5x + 3$$

4. Find the equation of the tangent line in the form $y = mx + b$, at the point $(-1, \frac{1}{2})$ for the function $f(x) = \frac{x}{x-1}$

5. Differentiate the following function and simplify the derivative

   (a) $f(x) = \sqrt{x} + 3x + \frac{1}{3x} + \frac{1}{x^2}$

   (b) $f(t) = \dfrac{t^3 - 4t^2}{2t}$

   (c) $y = x^2(x - 4)$

   (d) $f(x) = \dfrac{1 - x}{3 + x}$

6. Find the first and second derivative of the function and simplify your answer

   (a) $f(x) = x^4 - 3x^2 + 12x - \frac{40}{x}$

(b) $g(x) = (2 - 3x)(1 + x^2)$

(c) $h(x) = \sqrt{x} - \frac{1}{x} - 4x + 3$

7. Experiments indicate that when a flea jumps, its height after t seconds is given by the function

$$H(t) = 9t - 5t^2.$$

Find $H'(t)$. At what rate is $H(t)$ changing after 1 second? Is it increasing or decreasing?

8. Find the derivative of the following function. Do **not** simplify your answer

$$f(x) = \frac{2x^3 + x^2 - 8x + 2}{\sqrt{x} - 4x^2 + 3}$$