Exam #1

September 27, 2017

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. (5 points each) Evaluate the following limits algebraically, if they exist:

   a) $\displaystyle\lim_{x \to -\infty} \frac{x^2 + 3x - 1}{x^3 - 4x + 2}$

   b) $\displaystyle\lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4}$

   c) $\displaystyle\lim_{x \to 2} \frac{x - 2}{x^2 - 3x + 2}$

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

2. (5 points) Find the derivative of the function using the **definition of derivative**.

$$f(x) = \frac{2}{x}$$

3. (5 points each) Differentiate the following function and simplify the derivative

   (a) $f(x) = x^2 - \sqrt{x}$

(b) $f(t) = \dfrac{2t}{\sqrt{t}}$

(c) $f(u) = \dfrac{1 - 2u}{1 + 2u}$

4. (10 points each) Find the first and second derivative of the function and simplify your answer

(a) $f(x) = x(3x + 4)^5$

(b) $s(t) = \dfrac{4}{3-t}$

5. (10 points) The distance a particle travels in a particle accelerator in CERN is given by the following function
$$s(t) = \frac{32}{t} + 5t^2$$

(a) What is the velocity of the particle when $t = 2$?

(b) What is the acceleration of the particle when $t = 2$?

6. (5 points) Find the point (x, y), at which the graph $y = 3x^2 + 3x - 10$ has a horizontal tangent.

7. (4 extra credit points) The derivative of a function represents the average rate of change of the function with respect to its variable. (true/false)

8. (4 extra credit points) Given a function $f(x)$, if the left-hand and right-hand limits as x approaches c exist and are equal then the limit as x approaches c exist. (true/false)

Use this page if you need more space for a problem.