

**Math 295: Exam 1**  
**Fall – 2016**  
**09/23/2016**  
**55 Minutes**

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

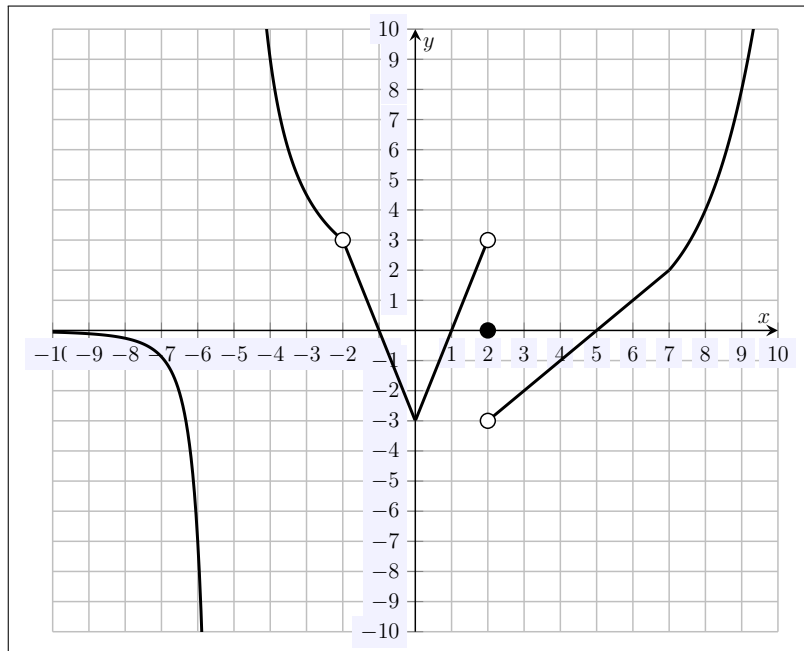
Write your name on the appropriate line on the exam cover sheet. This exam contains 7 pages (including this cover page) and 7 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	0	
2	0	
3	0	
4	0	
5	0	
6	0	
7	0	
Total:	0	

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1. Mark the following statements True or False:

- |  | True                     | False                    |
|--|--------------------------|--------------------------|
| (a) If a function is differentiable, then it is continuous.  | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) If $\lim_{x \rightarrow a^+} f(x)$ and $\lim_{x \rightarrow a^-} f(x)$ exist, then $\lim_{x \rightarrow a} f(x)$ exists. | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) If $\lim_{x \rightarrow a} f(x)$ exists, then $\lim_{x \rightarrow a^+} f(x)$ and $\lim_{x \rightarrow a^-} f(x)$ exist. | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) If a function is continuous, then it is differentiable.  | <input type="checkbox"/> | <input type="checkbox"/> |
| (e) $\lim_{x \rightarrow a} (f(x) + g(x)) = \lim_{x \rightarrow a} f(x) + \lim_{x \rightarrow a} g(x)$ .                     | <input type="checkbox"/> | <input type="checkbox"/> |
| (f) Polynomials are everywhere continuous.   | <input type="checkbox"/> | <input type="checkbox"/> |



2. Use the plot of the function  $f(x)$  above to answer the following questions:

(a)  $f(2) =$

(i)  $\lim_{x \rightarrow \infty} f(x) =$

(b)  $\lim_{x \rightarrow 2^-} f(x) =$

(j) What is the  $y$ -intercept of  $f(x)$ ?

(c)  $\lim_{x \rightarrow 2^+} f(x) =$

(k) What are the zeros of  $f(x)$ ?

(d)  $\lim_{x \rightarrow 2} f(x) =$

(l) If  $f(x)$  has any vertical asymptotes, give their equation.

(e)  $\lim_{x \rightarrow -2^-} f(x) =$

(m) Where is  $f(x)$  continuous?

(f)  $\lim_{x \rightarrow -2^+} f(x) =$

(n) List at least 4 values for  $x$  at which  $f(x)$  is not differentiable.

(h)  $\lim_{x \rightarrow -\infty} f(x) =$

3. Calculate the following limits. Be sure to show all work necessary to your computation!

$$\lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x^2 - x - 6}$$

$$\lim_{x \rightarrow 0} \frac{3x}{\sin 5x}$$

$$\lim_{x \rightarrow 0} (\csc x - \cot x)$$

4. Evaluate the following limits. You do not need to justify your answer.

$$(a) \lim_{x \rightarrow \infty} \frac{5x^2 + 8x - 4}{3x^3 - 4x^2 - x + 6} =$$

$$(b) \lim_{x \rightarrow \infty} \ln(2x^2 + x + 1) - \ln(7x^2 - x - 1) =$$

$$(c) \lim_{x \rightarrow \infty} \frac{2^x \sin x}{x^2 + 2x + 1} =$$

$$(d) \lim_{x \rightarrow -\infty} \frac{2x + 3}{\sqrt{4 - x}} =$$

$$(e) \lim_{x \rightarrow \infty} x \sin(1/x) =$$

$$(f) \lim_{x \rightarrow \infty} \frac{2x^4 + 6x - 4}{3x^2 + 4x + 2} =$$

$$(g) \lim_{x \rightarrow \infty} \frac{\ln x}{x + 1} =$$

$$(h) \lim_{x \rightarrow \infty} \frac{3x^2 + 4x - 1}{4x^2 - 5x - 2} =$$

5. Use the Squeeze Theorem to show  $\lim_{x \rightarrow 0} x^2 e^{\sin(1/x)} = 0$ .

6. Use the Intermediate Value Theorem to show that the equation  $e^x = x^2 - 1$  has a solution in  $[-2, 0]$ .

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7. Use the definition of the derivative to find the derivative of  $f(x) = x^2 - 3x + 1$ .