

# Practice Exam 1

Tuesday, February 10, 2015

## Instructions

- You have 40 minutes to complete this exam.
- Write on your own paper, not this exam.
- No calculators, phones, books, or collaboration.
- You may not use results not covered yet in class, such as the chain rule, l'Hôpital's rule, or the power rule for non-integer coefficients.
- Fully justify all answers.
- You do not need to simplify your answers unless the problem says otherwise.

## Problems (5 problems, front and back)

1. Fill in the blanks:

- A function  $f(x)$  is continuous at a point  $a$  if \_\_\_\_\_.
- The derivative of a function  $g(x)$  at a point  $b$  is \_\_\_\_\_.
- The function  $h(x)$  has a horizontal asymptote at  $y = c$  if \_\_\_\_\_ or \_\_\_\_\_.
- The function  $j(x)$  has a vertical asymptote at  $x = d$  if \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_.

2. Calculate:

- $\lim_{x \rightarrow \infty} 2 \arctan(x)$
- $\lim_{x \rightarrow \infty} \frac{x^2 - 4x + 1}{(2x - 1)^2}$

3. Calculate:

- $\frac{d}{dx} \left[ \frac{\sqrt{x}}{x^2 - 1} \right]$
- $\frac{d}{dx} 3e^x \sin(x)$
- $\frac{d}{dx} \left[ \frac{e^{2\pi} - 1}{2} \right]$

4. Use the definition of the derivative to calculate the derivative of the function  $\frac{4}{2-3x}$ .

5. Consider the function

$$f(x) = \begin{cases} 2 & \text{if your instructor likes the number } x, \\ 5 & \text{if your instructor does not like the number } x. \end{cases}$$

Determine the limit

$$\lim_{x \rightarrow 1^+} \frac{f(x)}{x-1}.$$

Justify your answer.

**Exam 1 will be held Wednesday, February 11 – that’s tomorrow! – from 6 PM - 8 PM in Lecture Center A1.**

Full solutions to this practice exam will be available at <http://math.uic.edu/~mclaury> this evening. And I have my usual office hours 3 PM - 4 PM today in the MSLC, located in SEO 430. The MSLC is open until 6 PM this evening and will open at 8 AM Wednesday morning.

Discussion classes are cancelled this Thursday.