Mathematics 121-A — Spring 2000

Quiz 3

February 25, 2000

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Name

Technology used: ______________________________

Textbook/Notes used: ______________________________

Directions: Be sure to include in-line citations, including page numbers if appropriate, every time you use a text or notes or technology. Include a careful sketch of any graph obtained by technology in solving a problem. **Only write on one side of each page.**

The Problems

1. Use the definition (the limit form) of derivative to find $f\,'(x)$ if $f(x) = \frac{1}{2x+1}$.

2. Below is the graph of a function on a grid. Assuming the grid lines are spaces 1 unit apart both vertically and horizontally, sketch the graph of the derivative function over the same interval. Use the same grid for your sketch.

3. State the definition of:

   (a) A function f being continuous at $x = c$.

   (b) A function f being differentiable at $x = c$.

4. Given the function $f(x) = \left\{ \begin{array}{rl} x^2 - 6, & x < 2 \\ -2, & x = 2 \\ Ax - 12, & x > 2 \end{array} \right]$

   (a) Determine, with explanation, a value of A that makes f continuous at $x = 2$ or explain why no such number A exists.

5. Do **one** of the following.

(a) When working with the exponential function $f(x) = 3^x$, some people prefer to use the function $g(x) = e^{kx}$ where $k = \ln(3)$. Use logarithm and exponential rules to show these are really the same function.

(b) Determine the **exact** values of each of the following.

i. $\arcsin(1)$

ii. $\arctan(1)$

iii. $\cos\left(\arccos\left(\sqrt{2}/2\right)\right)$

iv. $\arcsin(\sin(12\pi))$ [Be careful.]

v. $\exp(3\ln(4))$.

6. Do **one** of the following.

(a) Without using a calculator, determine the following limits. Be sure to briefly justify your answer.

i.

$$\lim_{x \to 0} \frac{\sin^2(x)}{x}$$

ii.

$$\lim_{x \to 0} \frac{1}{1 + 3^x}$$

iii.

$$\lim_{x \to 2} \frac{x^2 + 5x - 14}{3x^2 - 3x - 6}$$

(b) Without using a calculator, determine the following limits. Be sure to justify your answer.

i.

$$\lim_{x \to 1^-} \frac{10}{1 + 2^{1/(x-1)}}$$

ii.

$$\lim_{x \to 0^+} \left(\frac{1}{x} - \frac{1}{x^2}\right) \quad \text{Hint: } \frac{\infty}{\infty} \text{ is a “be careful” (indeterminate) form.}$$