Math 1A—Calculus, Spring 2014—Haiman
Midterm Exam 1

1. (8 pts each part) (a) Find the domain of the function $f(x) = \sqrt{\log_2 x}$.

(b) If $f(x)$ is one-to-one, find its inverse function. If $f(x)$ is not one-to-one, explain why.

2. (12 pts) Express the slope of the tangent line to the graph $y = \sin x$ at the point $(0, 0)$ as a limit. You do not have to evaluate the limit.

3. (12 pts) Which one of the intervals

$$(0, 1), \quad (1, 4) \quad \text{or} \quad (4, 9)$$

contains a root of the equation

$$\sqrt{x} = \frac{x-1}{10-x},$$

and why? You may take as known that only one of these intervals contains a root.

4. (12 pts) Evaluate the limit (possibly as an infinite limit) or explain why it does not exist.

$$\lim_{x \to -\infty} \cos(3^x + \pi)$$

5. (12 pts) Evaluate the limit (possibly as an infinite limit) or explain why it does not exist.

$$\lim_{x \to \pi/2} \frac{1}{1 - \sin x}$$

6. (12 pts) Find all horizontal and vertical asymptotes of the graph

$$y = \frac{2x^2 - 5x + 9}{x^2 - 9}.$$

7. (12 pts) Find the constant C that makes the function

$$f(x) = \begin{cases} 2x + C & x \leq 2 \\ \dfrac{x^2 - 3x + 2}{x - 2} & x > 2 \end{cases}$$

continuous on $(-\infty, \infty)$.

8. (12 pts) Fill in the missing numbers, functions or symbols indicated by the lettered boxes in the definition of

$$\lim_{x \to 3} \frac{1}{x+4} = 1/7.$$

For every number $\epsilon > 0$ there is a number $\delta > 0$ such that

$$\text{if} \quad 0 < |x - \boxed{\text{A}}| < \boxed{\text{B}} \quad \text{then} \quad |\boxed{\text{C}} - 1/7| < \boxed{\text{D}}.$$