Math 1A—Calculus, Fall 2010—Haiman
Midterm Exam 1

1. [10 pts] What is the geometric relationship between the graphs of $f(x) = \sqrt{x-3}+1$ and $g(x) = \sqrt{x} - 1$?

2. [12 pts] Find the inverse function of $f(x) = \ln(2 + \sqrt{x})$. What are the domain and range of $f(x)$ and of its inverse function?

3. [10 pts] Is $5^{\log_2 3}$ equal to $3^{\log_2 5}$? Justify your answer.

4. [10 pts] Sketch a graph of a function $f(x)$ such that $\lim_{x \to 1^-} f(x)$ and $\lim_{x \to 1^+} f(x)$ both exist, and f is continuous from the from the right at $x = 1$, but not continuous at $x = 1$.

5. [12 pts] Find
$$\lim_{x \to 2} \frac{x-2}{x - 4/x}$$

6. [12 pts] Find all vertical and horizontal asymptotes to the graph
$$y = \frac{2x^2}{x - 3x^2}.$$

7. [12 pts] Find the tangent line to the curve $y = 2x^3 - 3x$ at the point $(1, -1)$.

8. [10 pts] Differentiate $3e^{2x} + 4e^{-x}$

9. (a) [4 pts] Show that if $1 - \epsilon/5 < x < 1 + \epsilon/5$, then $2 - \epsilon < 5x - 3 < 2 + \epsilon$.

   (b) [8 pts] For what function $f(x)$ and numbers a and L does part (a) prove that $\lim_{x \to a} f(x) = L$?