

**Math 1A—Calculus, Fall 2010—Haiman**  
**Midterm Exam 3**

1. (10 pts) Find the limit:

$$\lim_{x \rightarrow 1} \frac{1 - x + \ln x}{(x - 1)^2}$$

2. (10 pts) Using Newton's method to approximate the solution of the equation  $\cos x = x$ , with initial approximation  $x_0 = 1$ , what is the next approximation? Since you don't have a calculator, write your answer as a formula, rather than evaluating it numerically.

3. (12 pts) Find all asymptotes, including slant asymptotes, to the graph

$$y = \frac{(2x + 1)^3}{(x + 1)^2}.$$

You do not have to sketch the graph.

4. (12 pts) Find the point or points on the parabola  $y = x^2$  closest to the point  $(0, 1)$  on the  $y$ -axis. Hint: you can simplify the problem by minimizing the square of the distance rather than the distance itself.

5. (12 pts) Find  $f(x)$  if  $f''(x) = x + \sin x$ ,  $f'(0) = 0$ ,  $f(0) = 2$ .

6. (12 pts) Evaluate the integral:

$$\int_2^4 \frac{x^2 - 1}{x} dx$$

7. (10 pts) Evaluate the integral:

$$\int_0^3 \sqrt{9 - x^2} dx$$

8. (12 pts) Find the derivative  $f'(x)$ , where

$$f(x) = \int_0^{x^2} \tan(\sqrt{u}) du$$

9. (10 pts) Which is greater: the Riemann sum

$$\frac{1}{1} \cdot \frac{1}{3} + \frac{1}{1 + 1/3} \cdot \frac{1}{3} + \frac{1}{1 + 2/3} \cdot \frac{1}{3} = 47/60,$$

or the integral

$$\int_1^2 \frac{1}{x} dx = \ln 2,$$

and why?