

Name _____

Section time & instructor _____

Student ID _____

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

Instructions:

- Write your name, ID number and discussion section time and instructor's name at the top of this page. Do not look at the other pages until the signal to start is given.

- You may use one sheet (written on both sides) of prepared notes. No other notes, books, calculators, computers, cell phones, audio players, or other aids may be used.

- Use your own scratch paper for preliminary work, then write your solutions on the exam paper. Hand in only the exam paper itself.

- Write enough steps or words of explanation so that we can understand how you arrived at your answers. An answer that is just a number or a formula, without any explanation, will not receive partial credit if incorrect, and may not receive full credit even if correct.

- There are 9 questions, 100 total points.

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?