

Math F200 Midterm 3 Spring 2010

Name: _____

Student Id: _____

Rules:

You have 60 minutes to complete the exam.

Partial credit will be awarded, but you must show your work.

No calculators, books, notes, or other aids are permitted.

Turn off anything that might go beep during the exam.

If you need extra space, you can use the back sides of the pages. Please make it obvious when you have done so.

Good luck!

Problem	Possible	Score
1	20	
2	20	
3	20	
4	10	
5	10	
6	20	
Total	100	

1. (20 points)

Compute the following limits. For each application of l'Hôpital's rule, indicate what the indeterminate form is.

a. [8 points] $\lim_{x \rightarrow 0} \frac{\sin(x) - x}{x^3}$

a. [8 points] $\lim_{x \rightarrow \infty} x^2 e^{-2x^2}$

c. [4 points] $\lim_{x \rightarrow 0^+} x^{x^2}$

2. (20 points)

A particle is moving along the x axis. Let $s(t)$ be its position, $v(t)$ its velocity, and $a(t)$ its acceleration. Suppose

$$a(t) = \cos(t) + e^{-t}$$

$$v(0) = 1$$

$$s(0) = 0.$$

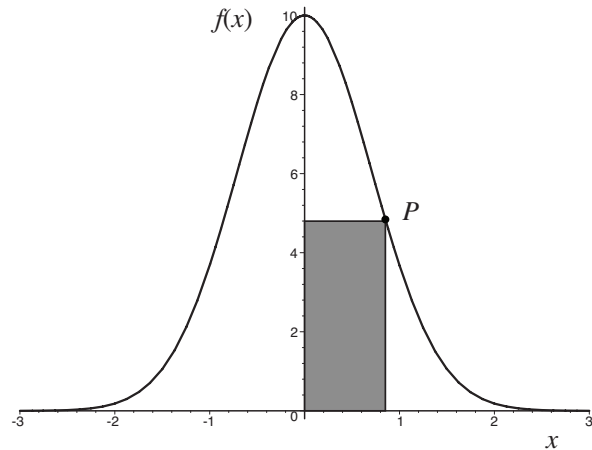
Determine $s(t)$.

Hint: Think about anti-derivatives.

3. (20 points)

Consider the function $f(x) = 10e^{-x^2}$. Construct a rectangle with one corner in the origin and the other corner at a point P on the graph of $f(x)$ with $x > 0$. Find area of the largest such rectangle.

Use the global first derivative test to justify that you have found a global maximum.



4. (10 points)

Find the maximum and minimum values of the function

$$f(x) = x - \ln(x)$$

on the interval $[\frac{1}{2}, 2]$. It may be helpful to know that $\ln(2) \approx 0.7$.

5. (10 points)

Approximate the solution of

$$xe^x = 3$$

using a single iteration of Newton's method starting at $x = 1$.

6. (20 points)

Use the guidelines from class to sketch the graph of the following function:

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

Your sketch should consider the following features: symmetry, asymptotes, areas of increase/decrease, local extrema, and points of inflection.