Math 111 Exam #3 November 30, 2016

Time:1 hour and 25 minutesInstructions:Show all work for full credit.No outside materials or calculators allowed.Extra Space:Use the backs of each sheetfor extra space.Clearly label when doing so.

Name: _____

ID #:

Instructor/Section:

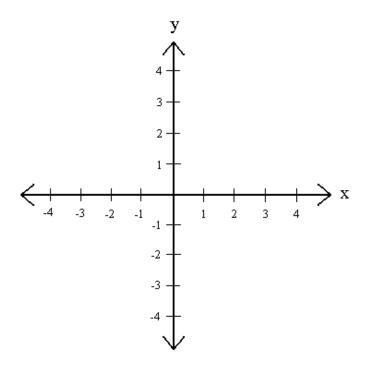
"I pledge by my honor that I have abided by the NJIT Academic Integrity Code."

_____ (Signature)

 Of all rectangles with a perimeter of 10 meters, which one has the maximum area? (Give both the dimensions and the area enclosed) (8 points)

Problem(s)	Score	Total

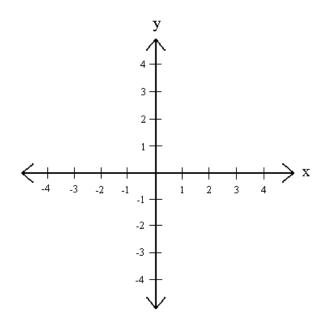
- 2. Given the equation y = x²/(x²-1)
 a) Find any intercepts and asymptotes of this function's graph (5 points)
 b) Find any critical points and determine if it is a relative maximum or minimum using the 2nd derivative test. (6 points)
 c) Sketch the function using the relevant information from parts (a) through (c) (5 points)



3. For the function f(x) = cos(x/3), find the absolute minimum and maximum values on the following range of x-values: $[\pi/2, 4\pi]$. (10 points)

4. Evaluate the indefinite integral (i.e. find the general antiderivative): (5 points) $\int \left(\frac{x^2 - \sqrt{x}}{x}\right) dx$

- 5. Given the function: $y = x^3 + 6x^2 + 9x$
- a) Find any critical points and determine if it is a relative maximum or minimum using the 2nd derivative test. (5 points)
- b) Find the intervals for which this function is concave up or concave down (4 points)
- c) Sketch the function using the relevant information from parts (a) through (c) (5 points)

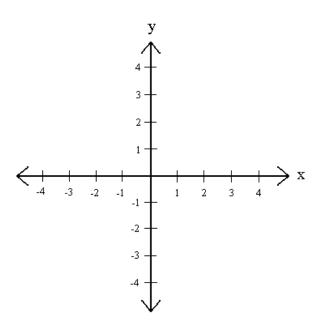


6. Estimate the area under f(x)=sin(x) between x=0 and x=π using the right endpoint of 4 rectangles of equal width. Show the graph of the function and your approximating rectangles. (7 points)

7. Evaluate the indefinite integral (i.e. find the general antiderivative): (5 points)

 $\int (2x^3 - 5x + 7^2 - e^x) dx$

8. Find the linear approximation of the function $f(x)=\ln(1+x)$ centered at x=0. Use this linearization to approximate the value of f(0.1). Graph both the linearization and the original function on the set of axis below. (10 points)



9. Evaluate the indefinite integral (i.e. find the general antiderivative): (5 points) $\int \cos(3x) dx$

Evaluate the following limits, allowing $+\infty$ and $-\infty$ as possible values of a limit. If the limit does not exist, explain why. Show all work. (5 points each) Problem 10 this column: a. $\lim_{x \to 0} \frac{e^x - x - 1}{x^2}$ **Problem 11 this column:**

a.
$$\lim_{x \to \infty} \frac{xe^{-3x}}{x^2}$$

b. $\lim_{x \to \pi/2} \frac{2\tan(x)}{\sec^2(x)}$

b. $\lim_{x \to \infty} 2x^2 \sin\left(\frac{1}{4x^2}\right)$