

Name: \_\_\_\_\_

**Mathematics 105**  
**Exam II**  
**November 13, 2009**

Problem	Possible	Actual
1	30	
2	20	
3	13	
4	2	
5	10	
6	25	
Total	100	

You must show all work to receive credit.

No electronic devices other than calculators are permitted.

Give exact answers (such as  $\ln 5$  or  $e^2$ ) unless requested otherwise.

1. Find  $\frac{dy}{dx}$  for the following equations.

(a)  $y = (\sin 5x)(\arcsin 5x)$

(b)  $y = \ln(xe^{x^2})$

(c)  $\ln y = r \ln x$

(d)  $x^2 + y^2 = 1$

(e)  $y = \frac{x^4 - 2x + 9}{x^3 - 3}$

2. For each of the following evaluate without the use of a calculator or explain why it does not exist.

(a)  $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$

(b)  $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

(c)  $\lim_{x \rightarrow 0} \frac{3x^2 - \pi x + 9}{4x^2 + e^x + 2}$

(d)  $\lim_{x \rightarrow \infty} \frac{3x^2 - \pi x + 9}{4x^2 + e^x + 2}$

3. Use Newton's Method with an initial guess of  $x_0 = 2$  to find the next two approximations to a solution of  $x^3 - 3x - 1 = 0$ .

4. What is an initial guess in the above problem that would cause Newton's Method to fail? Justify your answer.

5. Write  $\cos(\arcsin(2x))$  as an algebraic expression.

6. Consider the coordinate pair  $(x, y)$  lying on the circle  $x^2 + y^2 = 1$ . Find the maximum and minimum values of the product  $xy$  and give the location(s) on the circle where the maximum and minimum is. Points will be awarded for careful work and thorough exposition (label equations and explain what you are doing and why). (Hint: the problem may be easier using implicit differentiation and you may cite problem 1(d) in your solution.)