

Math 124 A, B - Spring 2005  
Mid-Term Exam Number Two  
May 17, 2005

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

Section: \_\_\_\_\_

1	12	
2	12	
3	10	
4	10	
5	16	
6	10	
Total	70	

- Complete all questions.
- You may use a calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 80 minutes to complete the exam.

1. Find  $\frac{dy}{dx}$  for each of the following expressions. You do not have to simplify your result.

(a)  $y = (x^2 + 3x)e^{5-3x}$

(b)  $y = \frac{4x^5 - 12x^2 + 3}{6x^2 - 9x}$

(c)  $y = \sqrt{\frac{1}{2}x + \sin(x^3 - x)}$

2. Find  $\frac{dy}{dx}$  for each of the following expressions. You do not have to simplify your result.

(a)  $y = \frac{x^{\ln x}}{x - 1}$

(b)  $x^4 + y^6 = 6$

(c)  $xy - \sin y + \sin x = 1$

3. Find the equation of the tangent line to the curve

$$\sin x + x \cos y = 6x + y$$

at the point  $(0, 0)$ .

4. Find the linear approximation of the function  $f(x) = \ln x$  at  $a = e^2$  and use it to approximate the number  $\ln 7$ .

5. You are running at 6 meters per second along horizontal ground in a straight line toward a point directly below a vertically rising hot air balloon. The balloon is rising at 3 meters per second.

(a) How fast is the distance between you and the balloon changing when the balloon is 60 meters high, and you are 40 meters from the point on the ground directly below the balloon?

(b) How fast is your angle of view (i.e., the angle between the balloon, you, and the horizon) to the balloon changing at that point?

6. Find all points on the curve  $y = x + \frac{1}{x}$  at which the tangent line passes through  $(0, \frac{1}{3})$ .