

Math 180  
Winter, 2009

Name \_\_\_\_\_

Homework #8  
Due Thursday, January 22  
No late papers accepted! No excuses!

1. A 13-foot ladder is leaning against a house when its base starts to slide away. By the time the base is 12 feet from the house the base is moving at a rate of 5 feet per second.
  - a) How fast is the top of the ladder sliding down the wall then?
  - b) At what rate is the area of the triangle formed by the ladder, wall, and ground changing then?
  - c) At what rate is the angle between the ladder and the ground changing then?

2. A balloon is rising vertically above a level, straight road at a constant rate of 1 foot per second. Just when the balloon is 65 feet above the ground, a bicycle moving at a constant rate of 17 feet per second passes under it. How fast is the distance between the bicycle and balloon increasing 3 seconds later?

3. Find the linearization of  $f(x) = \sqrt{x+1} + \sin x$  at  $x = 0$ . Use the linearization to approximate  $f(0.1)$ .

4. Find all values of the constants  $a$  and  $b$  for which the function

$$f(x) = \begin{cases} ax, & x < 2 \\ ax^2 - bx + 3, & x \geq 2 \end{cases}$$

will be differentiable for all values of  $x$ ?

5. Derive the derivative of  $y = \arcsin x$  using implicit differentiation.