

Name: \_\_\_\_\_ / 20

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

**1. [5 points]**

a. Compute the linear approximation of  $f(x) = 1/x$  at  $x = 10$ .

b. Use your answer above to find a decimal approximation for  $1/11$ .

**2. [8 points]** A girl flies a kite at a height of 300 ft. A wind blows the kite horizontally at a rate of 25 ft/sec. How fast must she let out the string for the kite when the kite is 500 ft away from her?

3. [8 points] A population of bacteria is growing exponentially. At time  $t = 0$  minutes there are 500 bacteria. At time  $t = 30$  minutes there are 1200 bacteria. Find an expression for  $P(t)$ , the population of the bacteria at any time  $t$ . Your expression must be such that if you know the time  $t$  and you have a calculator, then you can compute the number  $P(t)$ .
4. [4 points] The volume of a cone is given by  $V = \frac{1}{3}\pi r^2 h$  where  $r$  is the radius of the base of the cone and  $h$  is the height of the cone. Use a differential to estimate the change in volume of the cone if the height is fixed at 9 feet and the radius changes from 5 feet to 5.5 feet.