**Name:** _____ _____ **/ 25**

**Instructor: Bueler | Jurkowski | Maxwell**

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 bacteria culture initially contains 100 cells and grows at a rate proportional to its population. Suppose after an hour, the population is now 300. Given that the equation $y = Ce^{kt}$ models the population at time $t$:

**a**. Determine $C$.

**b**. Find a simplified expression for $k$.

**2. [6 points]** Suppose we are enlarging a rectangular photograph where the height is always twice the width. If the width is increasing at a rate of 2 cm/min, what is the rate at which the area of the rectangle is changing when the width is 5 cm long?

**3. [7 points]** A plane flying horizontally at an altitude of 3 km and a speed of 400 km/hr is flying directly away from a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 5 km away from the station. (Distance here is total distance, not horizontal distance.)

**4. [7 points]**

**a**. Find the linearization of $f(x) = \sqrt{x}$ at $a = 16$.

**b**. Use part **a.** to estimate $\sqrt{17}$. A simplified fraction or decimal will suffice.