

Name: _____

Collaborator(s): _____

Please take your time and answer each question clearly and carefully. You may work with other students, but please be sure to write your own version of your solutions, in your own words, on this sheet. Please note your collaborators above. Collaboration is optional, but please spend your time constructively.

1. Consider a population model where the size of a town's population is given by:

$$P(t) = 16250 \cdot (0.87)^t,$$

where t is measured in years since 1985.

- (a) What is the rate of change of the population, as a function of t ?
- (b) What is the rate of change of P in the year 2000? End with a numerical answer. (Use a calculator of some kind. Ask a neighbor or me if you don't have one).
- (c) Same question, for 2010? How does this compare to (b)?
- (d) Based on your answers above, what is the long-term behavior of $P(t)$? What is another way you could determine this (we learned it a few chapters ago)?

2. Using the rules we have just learned, give the derivatives of the following functions:

(a) $f(t) = 3t^2 + 2t - te^t$

(b) $g(x) = 3k \sin(x) + 3$

Assume k is a constant.

(c) $y = e^x \cos(x) + \cos(x)$

(d) If $P(t) = 600e^t$, find $\frac{P'(t)}{P(t)}$.

Remember that we called this the relative growth rate.