

## Math 118 – Homework 1 SOLUTION

Let  $P = P(t)$  be a function that represents the size of a population at some time  $t$ . Consider the following differential equation:  $P' = .017P$ . This differential equation is an example of a “population growth model”.

- Why is this name appropriate for the model? How does the equation model how a population might grow?

The differential equation  $P' = .017P$  shows that the rate of growth of the population is proportional to the population  $P$  itself. This makes sense for a population growth model because the larger a population is, the greater the number of offspring the population produces. Thus  $P'$ , rate of growth of the population, depends on the size of the population itself  $P$ .

- What type of function must  $P(t)$  be in order to satisfy the equation? What is your reasoning? (Note: You are not asked to solve the equation.)

$P' = .017P$  indicates that the derivative of  $P$  looks like the original function  $P$ . Therefore the function  $P(t)$  is exponential because exponential functions have the property that the derivative is again (a multiple of) an exponential function.