6.5 - Exponential Growth and Decay

6.5a

Exponential growth and decay equation

$P(t) = P_0 e^{kt}$, where P_0 is the initial population and k is the constant relative growth rate

Exercise:

A bacteria culture grows with constant relative growth rate. The bacteria count was 400 after 2 hours and 25,600 after 6 hours.

a) What is the relative growth rate? Express your answer as a percentage.
b) What was the initial size of the culture?
c) Find an expression for the number of bacteria after t hours.
d) Find the rate of growth after 4.5 hours.

6.5b

Newton's Law of Cooling

$T(t) = D_0 e^{kt} + T_s$, where D_0 is the initial temperature difference and T_s is the surrounding temperature

Exercise:

A roast turkey is removed from an oven when its temperature has reached $185^\circ F$ and is placed on a table in a room where the ambient temperature is $75^\circ F$.
a) If the temperature of the turkey is $150^\circ F$ after half an hour, what is the temperature after 45 minutes?
b) When will the turkey have cooled to $100^\circ F$?