Section 4.7: Modeling Growth and Decay

Exponential Growth:

$$A(t) = A_0 e^{kt}, \quad k > 0$$

Exponential Decay:

$$A(t) = A_0 e^{kt}, \quad k < 0$$

Where

$A(t)$ = amount present at time t

$A_0 = A(0)$ = initial amount present

k is the growth (if $k > 0$) or

decay (if $k < 0$) constant

Examples (Uninhibited Growth):

1. The population of Kenya was 13.6 million in 1995 and 29.5 million in 1999.

a) Assuming it increases exponentially, find a formula for the population of Kenya (in millions) t years after 1995.

b) What will the population be in the year 2005?

2. The population of the United States (in millions) at time *t* years after 1980 is given by: $A(t) = 226.5e^{0.0093t}$

After how many years is the population expected to reach 300 million?

Examples (Uninhibited Decay):

3. Radioactive strontium-90 decays according to $A(t) = A_0 e^{-.0244t}$.

In 1960, radioactive stontium-90 was released into the atmosphere during testing of nuclear weapons, and was absorbed into people's bones.

How many years does it take until only 10% of the original amount absorbed remains?

4. The voltage of a certain conductor decreases over time according to the law of uninhibited decay: $V(t) = V_0 e^{kt}$, $\mathrm{k} < 0$.

If the initial voltage is 200 volts and 3 seconds later it is 75 volts, then what is the voltage after 5 seconds?