University of South Carolina
Math 111: College Algebra
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Section 8
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Applications of Exponential Functions

1. Suppose you invest \$5000 in at 7% interest.
a. Construct functions that model the growth of your investment if it is compounded annually, monthly, and continuously.
b. Convert the last function to Ca^t form.
c. Identify the growth factor, growth rate (also called the "effective interest rate" or "APY"), and continuous growth rate (also called the "nominal interest rate" or "APR") of each.

Suppose your account compounds continuously.
d. What will be the value of your investment after 10 years?
e. When will your investment be worth \$8000?
f. If you want your investment to be worth \$10000 within 20 years, how much should you invest initially?

2. In 2007, the average American household owed a balance of almost $9200 on credit cards. For late payments, credit card companies typically charge a high annual percentage rate (APR) that could be anywhere from 10% to 20%.

a. Assuming that, at this moment, you have a $9200 balance on a credit card with a 20% APR compounded continuously, construct an exponential model where t denotes years from now.

b. If you made no payments and no charges for 6 months, how much would you owe?

c. If you make no payments and no charges, how long will it take for your debt to double?

d. Convert your function to Ca^t form.

e. Identify the growth factor, growth rate (also called the "effective interest rate" or "APY"), and continuous growth rate (also called the "interest rate" or "APR").

3. One of the toxic radioactive by-products of nuclear fission is strontium-90. A nuclear accident, like the one in Chernobyl, can release clouds of gas containing strontium-90. Strontium-90 is particularly insidious because it has a half-life of approximately 28 years. That means that every 28 years about half of the existing strontium-90 has decayed into nontoxic, stable zirconium-90, but the other half still remains.

a. Construct a model for the decay of 100 mg of strontium-90 as a function of 28-year time periods.

b. Construct a new model that describes the decay as a function of 1-year time periods.

c. How much strontium-90 remains after 35 years?

d. How many years are required for the sample to decay to less than 1 mg?

e. Convert the function from part (b) to Ce^{kt} form.

f. Identify the decay factor, decay rate, and continuous decay rate.