Worksheet – Compound and continuous growth
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Name:__________________________

Equation for compound growth:

\[ A(t) = P \left( 1 + \frac{r}{n} \right)^{nt}, \]
where \( A(t) \) is the final amount, \( P \) is the principal, \( r \) is the growth rate expressed as a decimal, \( n \) is the number of times compounded per year, \( t \) is time in years.

Equation for continuous growth:

\[ Q(t) = ae^{kt}, \]
where \( a \) is the initial amount, \( k \) is the growth rate, and \( t \) is time. When used for continuously compounded interest calculations, the formula is sometimes expressed as \( A(t) = Pe^{rt} \).

**Compound growth**

1. You invest $7000 in an account bearing 5% interest for ten years.
   a. How much will the account be worth if compounded quarterly? What about monthly? Daily?

   b. What do you notice about the amount of additional money you make as the frequency of compounding increases?

2. A long-term bond returns you $21,171.63 at the end of ten years. Assuming an interest rate of 4.5% compounded daily, what was the amount of your initial investment?
3. What is the effective annual yield of an investment that offers a nominal rate of 5% compounded monthly? What about the effective annual yield of an investment offering 5% compounded daily?

**Continuous growth**

4. The population is a certain city increases by 2.3% per year. Assuming the population in 2000 was 7.6 million, what is the population expected to be in 2010? What was the population in 1980?

5. A certain radioactive compound decays at a rate of 0.0345% per year. Given 200 grams of the compound, how much will remain after 500 years? After 5000 years? How about 500 years ago?

6. Your bank is offering a savings account with a nominal rate of 1.5%, compounded continuously. If you deposit $1,000 in 2010, what will your balance be in 2020? What is the effective annual yield?