Section 1.3
Section Objectives:

- Know how to calculate compound interest.
- Know what the nominal rate, the effective annual yield, and present value are and how to find them.
- Understand the connection between compounding n times per year and compounding continuously.
- Know how to calculate interest compounded continuously and also find the effective annual yield and present value in these situations.
- Work with exponential functions (both of growth and decay) in a variety of settings.
- Be able to identify the properties of a graph of an exponential function.
- Solve equations with exponents.

Practice Problems

Solutions (Warning: Reading through the solutions is not nearly as effective as working out the problems on your own and then comparing your answers with the solutions.)

1. Samuel puts $3,500 into a bank account. How much money will he have after 3 years in each of the following situations.

   (a) the account earns 1.4% interest compounded annually.

   $$3500(1+.014)^3 = 3649.07$$

   (b) the account earns 1.4% interest compounded monthly.

   $$3500\left(1+\frac{.014}{12}\right)^{3\cdot 12} = 3650.64$$

   (c) the account earns 1.4% interest compounded weekly (you may assume there are exactly 52 weeks in a year).

   $$3500\left(1+\frac{.014}{52}\right)^{3\cdot 52} = 3650.13$$

(d) the account earns 1.4% interest compounded daily. (Assume no leap years).

$$3500\left(1+\frac{.014}{365}\right)^{3\cdot 365} = 3650.13$$

(e) the account earns 1.4% interest compounded once per hour.

$$365 \text{ days} \cdot 24 \frac{\text{hrs}}{\text{day}} = 8760 \text{ hrs/year}$$

$$3500\left(1+\frac{.014}{8760}\right)^{8760\cdot 3} = 3650.13$$

(f) the account earns 1.4% interest compounded continuously

$$3500 \cdot e^{(0.014)\cdot 3} = 3650.13$$

(g) Relate the answers you got above to the idea of compounding continuously.

As we increase the number of times compounded per year we approach the value for compounded continuously.

(an rounded to neare

2. Patrick wants to give his future first born child $\$3,000$ on his 18th birthday. He knows his first born will be born exactly 8 years from today (he's psychic). How much money does he need to but into a bank account earning 5% interest today if that account:

   (a) is compounded monthly

   (b) is compounded continuously

3. An account has a nominal rate of 2.2%. What is the effective annual rate if it:

   (a) is compounded weekly

   (b) is compounded continuously

4. Researchers found that from 1800 to 1950, the population of Connecticut was growing approximately exponentially. In 1860, the population was 460 thousand. In 1920, it was 1,381 thousand. We fill find and work with a model for the population size.

   (a) By dividing the two population sizes, find percentage growth of the population between 1860 and 1920.

   (b) This tells us the percent growth over 60 years. So we know that (1+annual growth)^{6}0 =percentage growth from above. Solve for the annual growth.

   (c) Use the information above to find a population model for Connecticut where the input is years since 1860.

   (d) What does the model predict the population of Connecticut will be in 1950? How does this compare to the actual population in 1950? (Google the 1950 Connecticut population)

   (e) What does the model predict the population of Connecticut will be in 2018? How does this compare to the actual population? Why do you think the values are so different?

5. Graph $y = 2^x, y = 2^{-x}, y = \frac{1}{2}^x$, and $y = \frac{1}{2}^{-x}$. Are any of these graphs the same as each other? Explain your reasoning.

More Practice from Textbook 1.3: You should do as many problems from each set (1-8, 9-16,17-24, 25-38, 39-71, 72-75, 76-77,78, 79-82), as needed until you are comfortable with these techniques. 72-75 and 79-82 are good practice for more complicated application problems.