IM2 Problem Set 5.8 - Working with Exponential Functions

BIG PICTURE of this UNIT:	• How can we analyze growth or decay patterns in data sets & contextual problems? • How can we algebraically & graphically summarize growth or decay patterns? • How can we compare & contrast linear and exponential models for growth and decay problems. • How can we extend basic function concepts using exponential functions?

Part 1 - Skills/Concepts Review

1. **(CA - GEOGEBRA)** **Investigation #1**

   a. Use GEOGEBRA to graph $y = 2^x$.
   b. Create a "point on object" ⇒ in other words, put a point onto $g(x)$ using the "point on object" tool
   c. Use the rotation tools (3rd last tool icon) and use it as follows:
      i. Reflect across the x-axis
      ii. Reflect across the y-axis
      iii. Reflect across the line $y = x$
      iv. Rotate 180°
   d. Perform these changes on the function $g(x)$ as well as the point. Describe what happens to both the point and the exponential function.
   e. Write down the new "equation" of the exponential function each time and explain how the equation of the function is related to the change being made

2. **(CA)** Your new computer cost $1500 but it depreciates in value by about 18% each year.

   a. Write an equation that would indicate the value of the computer at t years.
   b. How much will your computer be worth in 6 years?
   c. About how long will it take before your computer is worth close to zero dollars, according to your equation?

3. **(CA)** From 1991 to 1995, the number of computers C per 100 people worldwide can be modeled by the function $C(t) = 25.2(1.15)^t$ where t is the number of years since 1991.

   a. Identify the initial amount, the growth factor and the annual percent increase.
   b. Write down your TI-84 window settings that allowed you to see the graph.
   c. Estimate the number of computers in 2000?
   d. In what year does the number of computers exceed 60 computers per 100 people?

4. **(CA)** You deposit $1600 in a bank account. Find the balance after 3 years if the account pays 2.5% annual interest compounded quarterly.

5. **(CI)** Evaluate the following expressions without a calculator.

   a. $8^{\frac{2}{3}} + (-27)^{\frac{2}{3}} + 25^{-\frac{3}{2}}$
   b. $\left(\frac{8}{27}\right)^{-\frac{2}{3}} \times \left(\frac{1}{4}\right)^{-1.5}$
   c. $\left(\sqrt[3]{64}\right)^{4} + \left(\sqrt{3}\right)^{6} \times \left(\sqrt[4]{3}\right)^{-8}$

6. **(CA)** The population of HS students at CAC can be modeled with an exponential function. The number of students continues to decline at an annual rate of 11%. If there were 350 students present in 2013, how many HS students would be predicted to be at CAC in 2020?

Part 2 - Skills/Concepts Application Problems

7. **(CA)** In 8 years, you want the money you invest to reach $10,000. The account pays 8% annual interest compounded monthly. How much money do you need to invest?

8. **(CA)** The population of HS students at CAC since the year 2000 can be modeled with an exponential function. The number of students continues to decline at an annual rate of 11%. There are currently 320 HS students at CAC. How many were present in 2000?

9. **(CA)** After investing $2000 for 15 years, you now have $8,000. What interest rate does the investment pay annually?

10. **(CA)** The population of HS students at CAC can be modeled with an exponential function. If there were 370 students present in 2011 and 315 students in 2014, what is the annual rate of decrease of student population in HS at CAC?

11. **(CA)** The value of land in New Cairo grows exponentially. Five years ago, 10 hectares of land cost 0.75 million LE and today, the same 10 hectares cost 2.5 million LE. Determine the annual rate of increase of the land

12. **(CI)** Solve the following equations and then use the TI-84 to verify your solutions.

   a. $2^{3-2x} = 2^{x}$
   b. $4^{1-2x} = 2$
   c. $4^{1-2x} = 2^{x}$
   d. $\left(\frac{1}{4}\right)^{2x+1} = \left(\frac{1}{8}\right)^{3-x}$