IM2 Problem Set 6.7 - 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? • How can we extend basic function concepts using exponential functions?

Part 1 - Skills/Concepts Review

1. **(CI)** The expression $7^{\frac{1}{3}}$ can be rewritten in radical form as $\sqrt[3]{7}$ and the expression $7^{\frac{2}{3}}$ is rewritten as either $\left(\sqrt[3]{7}\right)^2$ or $\sqrt[3]{7^2}$. Rewrite each exponential expression in radical form (and vice versa in Qb).

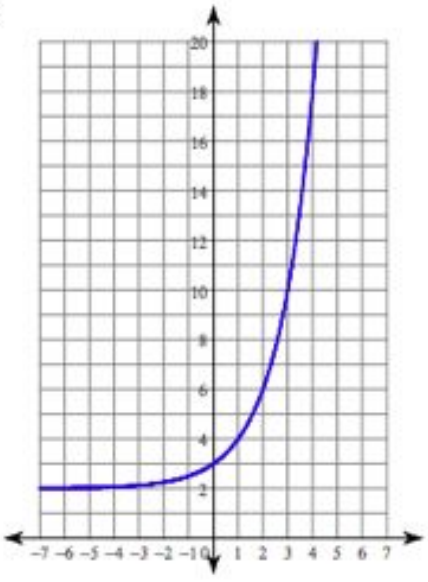
   a. (i) $5^{\frac{1}{2}}$ (ii) $4^{\frac{4}{3}}$ (iii) $2^{\frac{5}{3}}$ (iv) $7^{\frac{4}{3}}$

   b. (i) $\left(\sqrt{10}\right)^3$ (ii) $\sqrt[6]{2}$ (iii) $\sqrt[4]{2^5}$ (iv) $\left(\sqrt[4]{6}\right)^5$

2. **(CA)** Mr. S would like to know the equation of the following exponential functions that have been graphed for you.

Write an equation for each graph.

7)



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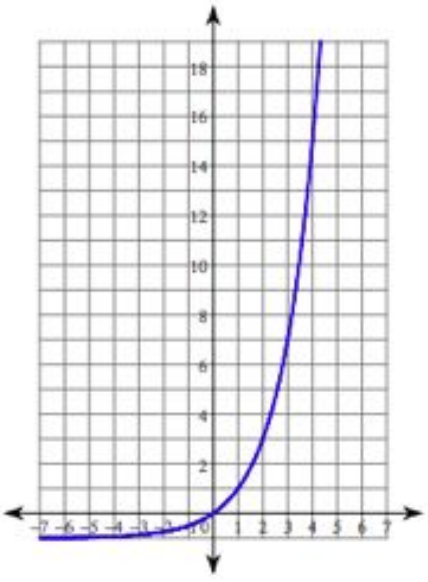

3. **(CI)** Evaluate the following expressions without a calculator.

   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. $\left(\sqrt[3]{64}\right)^4 + \left(\sqrt{3}\right)^6 \times \left(\sqrt[4]{3}\right)^{-8}$

4. **(CA)** An Exponential equation has the form $y = a(b)^x$ or $y = a(1 + r)^x$, where a = initial value, b is the growth factor/common ratio. (It turns out that $b = 1 + r$, where r is the decimal value of % increase given). For the following equations, (i) decide if they can be used to model growth or decay and (ii) determine the rate at which the change happens.

   a. (i) $y = 400(1 + \frac{0.05}{12})^x$ (ii) $y = 100(0.90)^x$ (iii) $y = 100(1 - 0.08)^x$
   b. (i) $y = 1{,}000(0.30)^x$ (ii) $y = 2500(1 + \frac{0.12}{365})^x$ (iii) $y = 50(1 + \frac{0.025}{6})^x$

Part 2 - Skills/Concepts Application Problems

5. **(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?

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

   a. $2^{3-2x} = 2^x$ b. $4^{1-2x} = 8$ c. $4^{1-2x} = 16^x$ d. $\left(\frac{1}{4}\right)^{2x+1} = \left(\frac{1}{8}\right)^{3-x}$

7. **(CI)** Given the function $g(x) = 40 + (10)2^{x+3}$:

   a. Evaluate $g(-3)$, $g(-2)$, $g(-1)$, $g(0)$, $g(1)$, $g(2)$
   b. determine the x- and y-intercept(s) - if they exist
   c. determine the equation of the asymptote of $g(x)$
   d. sketch $g(x)$, labelling the data points and intercept(s) and the asymptote.

8. **(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?

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