### Lesson 16 Practice Problems

1. The revenues of two companies can be modeled with exponential functions $f$ and $g$. Here are the graphs of the two functions. In each function, the revenue is in thousands of dollars and time, $t$, is measured in years. The $y$-coordinate of the intersection is 215.7. Select **all** statements that correctly describe what the two graphs reveal about the revenues.
* 
	1. The intersection of the graphs tells us when the revenues of the two companies grow by the same factor.
	2. The intersection tells us when the two companies have the same revenue.
	3. At the intersection, $f\left(t\right)>g\left(t\right)$.
	4. At the intersection, $f\left(t\right)=215.7$ and $g\left(t\right)=215.7$.
	5. We need to know both expressions that define $f$ and $g$ to find the value of $t$ at the intersection.
	6. If we know at least one of the expressions that define $f$ and $g$, we can calculate the value of $t$ at the intersection.
1. The population of a fast-growing city in Texas can be modeled with the equation $p\left(t\right)=82⋅e^{\left(0.078t\right)}$. The population of a fast-growing city in Tennessee can be modeled with $q\left(t\right)=132⋅e^{\left(0.047t\right)}$. In both equations, $t$ represents years since 2016 and the population is measured in thousands. The graphs representing the two functions are shown. The point where the two graphs intersect has a $y$-coordinate of about 271.7.
* 
	1. What does the intersection mean in this situation?
	2. Find the $x$-coordinate of the intersection point by solving each equation. Show your reasoning.
		1. $p\left(t\right)=271.7$
		2. $q\left(t\right)=271.7$
	3. Explain why we can find out the $t$ value at the intersection of the two graphs by solving $p\left(t\right)=q\left(t\right)$.
1. The function $f$ is given by $f\left(x\right)=100⋅3^{x}$. Select **all** equations whose graph meets the graph of $f$ for a *positive* value of $x$.
	1. $y=10⋅e^{x}$
	2. $y=500⋅e^{x}$
	3. $y=500⋅e^{-x}$
	4. $y=1,​000⋅2^{x}$
	5. $y=600⋅10^{x}$
2. The half-life of nickel-63 is 100 years. A students says, “An artifact with nickel-63 in it will lose a quarter of that substance in 50 years.”
* Do you agree with this statement? Explain your reasoning.
* (From Unit 4, Lesson 7.)
1. *Technology required.* Estimate the value of each expression and record it. Then, use a calculator to find its value and record it.

| * expression
 | * estimate
 | * calculator value
 |
| --- | --- | --- |
| * $log123$
 | *
 | *
 |
| * $log110,​000$
 | *
 | *
 |
| * $log1.1$
 | *
 | *
 |

* (From Unit 4, Lesson 11.)
1. Here are graphs of the functions $f$ and $g$ given by $f\left(x\right)=100⋅\left(1.2\right)^{x}$ and $g\left(x\right)=100⋅e^{0.2x}$.
* Which graph corresponds to each function? Explain how you know.
* 
* (From Unit 4, Lesson 13.)
1. Here is a graph that represents $f\left(x\right)=e^{x}$.
* 
* Explain how we can use the graph to estimate:
	1. The solution to an equation such as $300=e^{x}$.
	2. The value of $ln700$.
* (From Unit 4, Lesson 15.)



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