Algebra 2/Pre-Calculus

Name_____

Finding Functions From Two Points (Day 6, Exponentials)

1. Suppose $f(x)$ is an exponential function such that $f(0)=4$ and $f(3)=108$. Find a formula for $f(x)$.

Here's one way of approaching the last problem:

$$f(x)=ab^x$$
$$4=ab^0$$
$$4=a$$
$$f(x)=4b^x$$
$$108=4b^3$$
$$27=b^3$$
$$b=3$$
$$f(x)=4\cdot 3^x$$

Notice that we are plugging in each of the input/output pairs that we were given. We can use the same type of approach on the following problem.

2. Suppose $g(x)$ is an exponential function such that $g(2)=12$ and $g(5)=96$.

a. Find a formula for $g(x)$. ***Note:*** There is a hint for how to do this in the next part of this question. But try it on your own first!

b. Write out two equation: One from the fact that $g(2)=12$ and one from the fact that $g(5)=96$. Then see if you can find the formula for $g(x)$.

c. You should have found that $ab^2=12$ and $ab^5=96$. Solve the first equation for a, then plug into the second equation. Again, see if you can find the formula for $g(x)$.

Here's what you should have found:

$$ab^2=12 \qquad ab^5=96$$
$$a=\frac{12}{b^2} \qquad \left(\frac{12}{b^2}\right)b^5=96$$
$$a=\frac{12}{2^2} \qquad 12b^3=96$$
$$a=3 \qquad b^3=8$$
$$b=2$$

Hence, $f(x)=3\cdot 2^x$. ***Note:*** We solved for *a* and *b* by using substitution, just as you would in a system of equations.

3. Suppose $h(x)$ is an exponential function such that $h(3) = 17.28$ and $g(5) = 24.8832$. Find a formula for $h(x)$. ***Note:*** Use the method from the last problem and use your calculator.

Answer: $h(x) = 10 \cdot 1.2^x$

4. Suppose $f(x)$ is an exponential function such that $f(3) = 691.2$ and $f(7) = 22{,}932.35712$. Find $f(6)$.

Answer: $f(6) = 9{,}555.1488$

5. Roman was studying bacteria in a Petri dish. After 1 hour, there were 3000 bacteria. After 6 hours, there were 200,000 bacteria.

a. Write a model giving the number of bacteria as a function of time.

b. How many hours will it take for the number of bacteria to reach 1,000,000?

c. How many hours does it take for the number of bacteria to double?

Answers: a. $f(x) = 1295.21 \cdot (2.316)^x$ b. 7.917 hours c. 0.825 hours

6. Shaydah bought a new car. Two years after she bought it, the car was worth $14,000. Three years after that, the car was worth $8,000. What was the value of the car when Shaydah bought it? What percent of it's value did it lose each year?

Answers: $20,330.75 and 17%