Logs and Exponentials MORE PRACTICE: Basic Exponential Equations

Label the following functions as exponential growth or decay.

1. $y = 7(2)^x$ growth

2. $y = 3(0.4)^x$ decay

3. $y = 9(\frac{1}{2})^{-x}$ growth

4. Write an exponential function that goes through (0, 2) and (3, 20).

$y = ab^x$ → at (0, 2), $y = 2 = a \cdot b^0 = a \cdot 1 = a$ so $y = 2b^x$

→ at (3, 20), $y = 20 = 2 \cdot b^3$ → $10 = b^3$ → $b = \sqrt[3]{10} = 2.15$ So $y = 2(2.15)^x$

5. Write an exponential function that goes through (0, 6) and (5, 15).

$y = ab^x$ → at (0, 6), $y = 6 = a \cdot b^0 = a \cdot 1 = a$ so $y = 6b^x$

→ at (5, 15), $y = 15 = 6 \cdot b^5$ → $2.5 = b^5$ → $b = \sqrt[5]{2.5} = 1.20$ So $y = 2.5(1.20)^x$

6. A water balloon explodes near your head. It starts out with a 2 inch diameter. As it blows up, the diameter of the water splash doubles every second. Write an equation that models this situation. What is the diameter of the splash in 5 seconds?

$y = ab^x$ → a = initial value = 2, b = growth factor = 2 (doubles), so $y = 2 \cdot 2^x$

When x = 5, $y = 2 \cdot 2^5 = 2 \cdot 32 = 64\ inches$

7. The population of rabbits in a nature preserve was 15 in 2000. The population grew exponentially to 645 in 2010. Write an equation that models the situation. What will the population be in 2020?

$y = ab^t$ → let the year 2000 be the initial time (t = 0), so $a = 15$ so $y = 15b^t$

The year 2010 corresponds to t = 10, $y = 645 = 15 \cdot b^{10}$ → $43 = b^{10}$ → $b = \sqrt[10]{43} = 1.46$
So $= 15(1.46)^x$. The year 2020 corresponds to t = 20, so $y = 15(1.46)^{20} = 29{,}050$