Pre-Calculus: 3.1 – 3.2 Review

Exponential and Logarithmic Functions and Models

Name: ______________________

Date: _______________ Hour: ___

1. Determine whether each of the functions are exponential growth, decay or not exponential. If it is growth or decay, find the percentage rate for the function. **(8 points)**

A. $a(x) = 3 \cdot 0.50^x$ Decay; 50%

B. $b(x) = 4 \cdot x^2$ Not Exponential

C. $c(x) = -3 \cdot 2^x$ Growth; 100%

D. $d(x) = x^{\pi}$ Not Exponential

2. Choose a basic exponential **growth** function from number 1 and determine the following. **(12 points)**

Which Function: $-3 \cdot 2^x$

A. Base: 2

B. Initial Value: $-3 \cdot 2^0 = -1 \cdot 1 = -3$

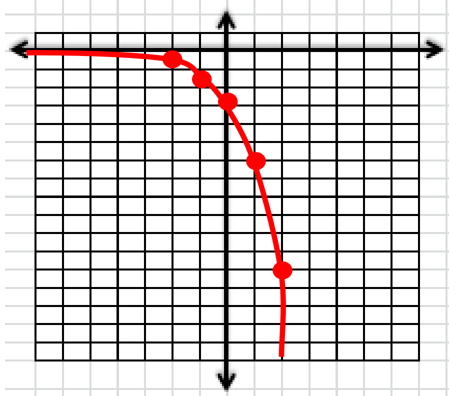
C. Asymptote(s): $y = 0$

D. Domain: $(-\infty, \infty)$

E. Range: $(-\infty, 0)$

F. Graph:

x	y
-2	$-3/4$
-1	$-3/2$
0	-3
1	-6
2	-12



3. Compute the **exact value** of the function for the given x-value **without** using a calculator. **(8 points)**

$f(x) = -2 \cdot 4^x$, $x = -1$

$-2 \cdot 4^{-1}$

$-2 \cdot \frac{1}{4^1} = -\frac{2}{4} = -\frac{1}{2}$

Solution: ___________

$g(x) = 5 \cdot 2^x$, $x = 3/2$

$5 \cdot 2^{\frac{3}{2}}$

$5 \cdot \sqrt[2]{2^3} = 5 \cdot \sqrt{8}$

$= 5 \cdot 2\sqrt{2} = 10\sqrt{2}$

Solution: ___________

$h(x) = 7 \cdot 3^x$, $x = -2$

$7 \cdot 3^{-2}$

$7 \cdot \frac{1}{3^2} = 7 \cdot \frac{1}{9} = \frac{7}{9}$

Solution: ___________

$k(x) = -1 \cdot 16^x$, $x = -3/4$

$-1 \cdot 16^{\frac{-3}{4}}$

$-1 \cdot \sqrt[4]{16^{-3}} = -1 \cdot \sqrt[4]{\frac{1}{16^3}} = -1 \cdot \sqrt[4]{\frac{1}{4096}}$

$= -1 \cdot \frac{\sqrt[4]{1}}{\sqrt[4]{4096}} = -1 \cdot \frac{1}{8} = -\frac{1}{8}$

Solution: ___________

4. Find the exponential function that satisfies the given conditions. **(8 points)**

A. Initial value = 20, increasing at a rate of 42.5% per year.

$f(x) = a \cdot b^x$

$a = 20; b = 42.5\% \rightarrow 0.425$

Increasing: $1 + 0.425 = 1.425$

$f(x) = 20(1.425)^x$

Solution: ______________________

B. Initial mass = 49g, decreasing at a rate of 4.67% every 4 days.

$f(x) = a \cdot b^x$

$a = 49; b = 4.67\% \rightarrow 0.0467$

Decreasing: $1 - 0.0467 = 0.9533$

$f(x) = 49(0.9533)^x$

Solution: ______________________

5. The population of Fowlerville is 565,000 and it is decreasing at a rate of 6.3% per year.

   a. Write an equation P(t) for the population at time t years from now. **(4 points)**

   $P(t) = P_0(1 \pm r)^t$

   $a = 565000; b = 6.3\% \to 0.063$

   Decreasing: $1 - 0.063 = 0.937$

   $\boldsymbol{P(t) = 565000(0.937)^t}$

   Solution: ______________________________

   b. Predict the population 7 years from now. **(2 points)**

   $P(t) = 565000(0.937)^t$

   $t = 7$

   $P(t) = 565000(0.937)^7$

   $\boldsymbol{P(t) = 358,252}$

   Solution: ______________________________

6. The population of Burkeville in 1993 was 48,000. It is and growing at a rate of 3.2% per year.

   A. Write an equation for the exponential situation. **(4 points)**

   $P(t) = P_0(1 \pm r)^t$

   $a = 48000; b = 3.2\% \to 0.032$

   Increasing: $1 + 0.032 = 1.032$

   $\boldsymbol{P(t) = 48000(1.032)^t}$

   Solution: ______________________________

   B. When will the population be triple of the original amount? **(2 points)**

   $P(t) = 48000(1.032)^t$

   $P(t) = 48000 * 3 = 144000$

   So, plug in $P(t)$ into your calculator and find where the "y-value" approaches 144000.

   - It happens between 34 and 35, exactly 34.9. Thus, 35 years later. So, 1993 + 35 = **2028.**

   Solution: ______________________________

7. Given the following points, determine the exponential equation. **(4 points)**

   (2, 2.6889) and (0, 4)

   $f(x) = a \cdot b^x$

   $a = 4$

   $4 \cdot b^x; x = 2 \to 4 \cdot b^2 = 2.6889$

   $b^2 = 0.672225 \to$ Square Root both Sides $\to b = 0.8199$

   $\boldsymbol{f(x) = 4 \cdot (0.8199)^x}$

   Solution: $f(x) =$ ______________

8. Determine exponential equation $f(x)$ and $g(x)$ based on values given in the following table. **(8 points)**

x	$f(x)$	$g(x)$
−2	.125	16
−1	.5	8
0	2	4
1	8	2
2	32	1

$f(x)$

$f(x) = a \cdot b^x$

$a = 2$

$2 \cdot b^x; x = 1 \to 2 \cdot b^1 = 8$

$b = 4$

$\boldsymbol{f(x) = 2(4)^x}$

$f(x) =$ ______________

$g(x)$

$g(x) = a \cdot b^x$

$a = 4$

$4 \cdot b^x; x = 1 \to 4 \cdot b^1 = 2$

$b = \frac{2}{4} = \frac{1}{2}$ or 0.5

$\boldsymbol{f(x) = 4\left(\frac{1}{2}\right)^x}$ ***or*** $\boldsymbol{f(x) = 4(0.5)^x}$

$g(x) =$ ______________