Name ______________________ Class ____________ Date ____________

Practice 5-1

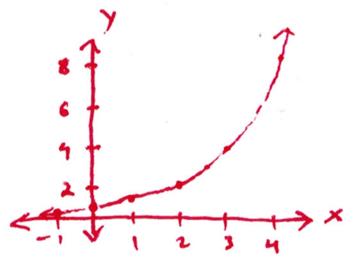
Exploring Exponential Models

Complete the table of values for each function. Then graph the function.

2. $y = 0.5(2)^x$

Exponential Growth

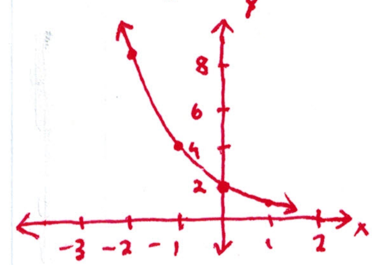
x	$0.5(2)^x$	y
−1	$0.5(2)^{-1}$	0.25
0	$0.5(2)^0$	0.5
1	$0.5(2)^1$	1
2	$0.5(2)^2$	2
3	$0.5(2)^3$	4
4	$0.5(2)^4$	8



4. $y = 2(0.5)^x$

Exponential Decay

x	$2(0.5)^x$	y
−2	$2(0.5)^{-2}$	8
−1	$2(0.5)^{-1}$	4
0	$2(0.5)^0$	2
1	$2(0.5)^1$	1
2	$2(0.5)^2$	0.5



Without graphing, determine whether the function represents exponential growth or exponential decay. Then find the *y*-intercept.

7. $y = 0.99\left(\frac{1}{3}\right)^x$

Decay b/c $b = \frac{1}{3} < 1$

y-int @ (0, 0.99) since $y = 0.99\left(\frac{1}{3}\right)^0 = 0.99$

8. $y = 20(1.75)^x$

Growth b/c $b = 1.75 > 1$

y-int @ (0, 20) since $y = 20(1.75)^0 = 20$

9. $y = 185\left(\frac{5}{4}\right)^x$

Growth b/c $b = \frac{5}{4} > 1$

y-int @ (0, 185) since $y = 185\left(\frac{5}{4}\right)^0 = 185$

10. $f(x) = \frac{2}{3}\left(\frac{1}{2}\right)^x$

Decay b/c $b = \frac{1}{2} < 1$

y-int @ $\left(0, \frac{2}{3}\right)$ since $y = \frac{2}{3}\left(\frac{1}{2}\right)^0 = \frac{2}{3}$

11. $f(x) = 0.25(1.05)^x$

Growth b/c $b = 1.05 > 1$ y-int @ (0, 0.25) since $y = 0.25(1.05)^0 = 0.25$

12. $y = \frac{1}{5}\left(\frac{6}{5}\right)^x$

Growth b/c $b = \frac{6}{5} > 1$

y-int @ $\left(0, \frac{1}{5}\right)$ since $y = \frac{1}{5}\left(\frac{6}{5}\right)^0 = \frac{1}{5}$

17. Identify the meaning of the variables in the exponential growth or decay function.

$$A(t) = a(1 + r)^t$$

A(t) is the final amount after t # of time periods

a. $a =$ initial amount

b. $r =$ growth rate (%)

c. $t =$ # of time periods

18. The population of Bainsville is 2000. The population is supposed to grow by 10% each year for the next 5 years. How many people will live in Bainsville in 5 years?

a; r = 0.10; t

Model: $A(t) = 2000(1 + 0.10)^t = 2000(1.10)^t$ Ans: After 5 yrs we have: $A(5) = 2000(1.10)^5$ $\boxed{\approx 3221}$ people

Write an exponential function to model each situation. Find each amount after the specified time.

14. A population of 1,236,000 grows 1.3% per year for 10 years.

a; r; t

Model: $A(t) = 1{,}236{,}000(1 + 0.013)^t = 1{,}236{,}000(1.013)^t$

Ans: After 10 yrs we have: $A(10) = 1{,}236{,}000 \cdot (1.013)^{10}$ $\boxed{\approx 1{,}406{,}413}$

15. A population of 752,000 decreases 1.4% per year for 18 years.

a; r; t

Model: $A(t) = 752{,}000(1 - 0.014)^t = 752{,}000(0.986)^t$

Ans: After 18 yrs we have: $A(18) = 752{,}000(0.986)^{18}$ $\boxed{\approx 583{,}448}$

16. A new car that sells for $18,000 depreciates 25% each year for 4 years.

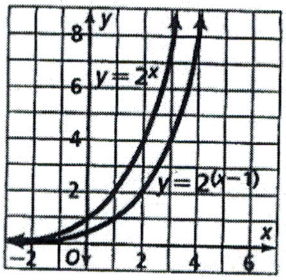
a; r; t

Model: $A(t) = 18{,}000(1 - 0.25)^t = 18{,}000(0.75)^t$

Ans: After 4 yrs we have: $A(4) = 18{,}000(0.75)^4 \approx \boxed{\$5{,}695.31}$

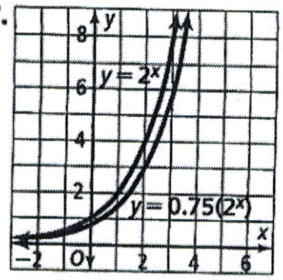
Identify each function as a compression, a reflection, or a translation of the parent function.

6.



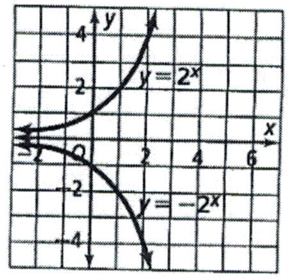
Translation 1 unit to the right

7.



Compression (shrink) by factor 0.75

8.



Reflection over x-axis

Write a function for the indicated transformation.

9. the function $y = 5^{(x-2)}$ vertically stretched by the factor $\boxed{3}$

$y = \boxed{3} \cdot 5^{(x-2)}$

10. the function $y = 7 \cdot 2^x$ translated up 8 units

$y = 7 \cdot 2^x + 8$

For each function, identify the transformation from the parent function $y = b^x$.

11. $y = 2^{(x-4)}$ translation 4 units to the right

12. $y = 20\left(\frac{1}{2}\right)^x + 10$ Vertical stretch by factor of 20 and translation up 10 units

13. $y = 4^{(x+2)}$ translation 2 units to the left

14. $y = 5(0.25)^x + 5$ Vertical stretch by factor of 5 and translation up 5 units

15. $y = -2(3)^x$ Vertical stretch by factor of 2 and reflection over x-axis

16. $y = \frac{1}{2}(9)^x$ Vertical shrink (compression) by factor of $\frac{1}{2}$

17. $y = 5^x + 3$ translation 3 units up