

**Algebra 1 Exponents Worksheet #1**

Name \_\_\_\_\_ Per \_\_\_\_

**For #1 – 18: Simplify the expression. Write your answer using exponents (evaluate numerical bases with powers  $\leq 4$ ).**

1)  $x^2 \cdot x^5$

2)  $y^3 \cdot y^3 \cdot y$

3)  $(-5)^3 \cdot (-5)$

4)  $(-8)^2$

5)  $-8^2$

6)  $(2x)^3$

7)  $(2x^2y^3)^5$

8)  $(a^4)^8$

9)  $8^5 \cdot 8^2$

10)  $(-6)^6(-6)$

11)  $2^4 \cdot 2^9 \cdot 2$

12)  $(7^4)^3$

13)  $y^9 \cdot y$

14)  $(y^4)^6$

15)  $-(5x)^2$

16)  $(-8m^4)^2 \cdot m^3$

17)  $(-3c^8)(2c^6d^8)$

18)  $(2y^5)^3(2y^2)^4$

**Multiple Choice:**

19) Which expression is equivalent to  $(-9)^6$  ?

- a)  $(-9)^2(-9)^3$       b)  $(-9)(-9)^5$       c)  $[(-9)^4]^2$       d)  $[(-9)^3]^3$

20) Which expression is equivalent to  $36x^{12}$  ?

- a)  $(6x^3)^4$       b)  $12x^4 \cdot 3x^3$       c)  $3x^3 \cdot (4x^3)^3$       d.)  $(6x^5)^2 \cdot x^2$

**For #21 – 24, Find the missing exponent.**

21)  $x^4 \cdot x^? = x^5$

22)  $(y^8)^? = y^{16}$

23)  $(2z^?)^3 = 8z^{15}$

24)  $(3a^3)^? \cdot 2a^3 = 18a^9$

25) Solve for y:  $\frac{y}{10} = \frac{7}{5}$

26) **BONUS:** Simplify:  $(-2x^3y^5)^3 \cdot (5xy^4)^2$

**Algebra 1 Exponents Worksheet #2**

Name \_\_\_\_\_ Per \_\_\_\_\_

**For #1-16, Simplify the expression. Write your answer using exponents (evaluate numerical bases with powers  $\leq 4$ ).**

1)  $\frac{3^9}{3^5}$

2)  $\frac{y^{15}}{y^9}$

3)  $\frac{6^7 \cdot 6^4}{6^6}$

4)  $\frac{9^8}{9^6}$

5)  $\frac{a^4}{a}$

6)  $\left(\frac{-1}{x}\right)^3$

7)  $(x^3y)^4$

8)  $\left(\frac{2}{b^2}\right)^3$

9)  $\left(\frac{y^5}{y^2}\right)^9$

10)  $\frac{x^5y^4}{x^2y^8}$

11)  $\frac{(-4)^9}{(-4)^2}$

12)  $\left(\frac{j}{k}\right)^{11}$

13)  $\left(\frac{-4}{x}\right)^2$

14)  $\left(\frac{7}{8}\right)^2$

15)  $\left(\frac{a^8}{ba^3}\right)^5$

16)  $\left(\frac{-5}{2}\right)^3$

For #17 – 18: Find the missing exponent.

$$17) \frac{7^2 \cdot 7^2}{7^4} = 7^6$$

$$18) \left(\frac{2c^3}{d^2}\right)^? = \frac{16c^{12}}{d^8}$$

Evaluate the expression for the given variable.

$$19) x^3 \text{ when } x = \frac{3}{4}$$

For #20 – 21: Solve for x.

$$20) \frac{x+3}{4} = \frac{7x-1}{2}$$

$$21) \frac{10}{z-1} = \frac{12}{z+7}$$

For #22-29, simplify the expression. Write your answer using positive exponents (evaluate numerical bases with powers  $\leq 4$ ).

$$22) 7^{-3}$$

$$23) 5(7x^3)^0$$

$$24) (-4)^0$$

$$25) x^{-2}$$

$$26) \frac{1}{6^{-2}}$$

$$27) \frac{a^5}{a^{-7}}$$

$$28) \frac{b^{-2}}{b^{11}}$$

$$29) \frac{a^3 y^3}{a^{10} y^{-5}}$$

$$30) \text{ Bonus: } \frac{4b^{-14}d^2}{2^3 b^{-5} d^{-7}}$$

# Algebra 1 Worksheet 6.1

Name \_\_\_\_\_ Per \_\_\_\_\_

For #1 – 13, solve each exponential equation.

1.  $2^x = 16$

2.  $3^x = 9$

3.  $4^x = 64$

4.  $125 = 5^x$

5.  $32 = 2^x$

6.  $2^{2x+5} = 2^7$

7.  $6^{3x-4} = 36$

8.  $5^{3x-12} = 125$

9.  $\frac{1}{4}(4)^x = 16$

10.  $4\left(\frac{1}{2}\right)^x = \frac{1}{4}$

11.  $36^{2x-7} = 6^{x-5}$

12.  $36^{\frac{4}{3}x} = 6^8$

13.  $5^{3x-5} + 10 = 635$

**Simplify each expression using exponential rules (note: don't leave negative exponents in final answer).**

14.  $(-6m^5)^3 \cdot m^9$

15.  $6(8x^4)^0$

16.  $\left(-\frac{5}{x^4}\right)^3$

17.  $\frac{a^4b^{-3}}{a^{-8}b^{12}}$

**Solve for the variable.**

18.  $\frac{x+3}{5} = \frac{x-2}{4}$

19.  $\frac{x+4}{6} = \frac{x-2}{3}$

**#20 & 21: BONUS. Show your work to receive credit**

20.  $8^{4x-5} + 5 = 37$

21.  $4^{x-8} \cdot 16 = 2^{4x-12}$

For #1 – 5, classify each function as linear or exponential.

1.

x	-2	-1	0	1	2
y	1	2	4	8	16

2.

x	-2	-1	0	1	2
y	$\frac{1}{25}$	$\frac{1}{5}$	1	5	25

3.

x	-2	-1	0	1	2
y	16	19	22	25	28

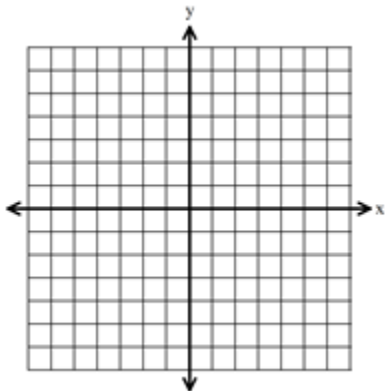
4.  $y = 3 \cdot (2)^x$       5.  $y = -6x + 9$

For #6 – 9, identify whether the exponential function models growth or decay.

6.  $f(x) = 2(4)^x$       7.  $y = \left(\frac{1}{3}\right)^x + 2$       8.  $y = (1.5)^x$       9.  $y = 3\left(\frac{2}{5}\right)^x$

For #10 – 15, graph each exponential function. State the domain, range, and write the equation of the horizontal asymptote (H.A). A table is provided if you wish to use it.

10.  $y = 3^x$



Growth or Decay?

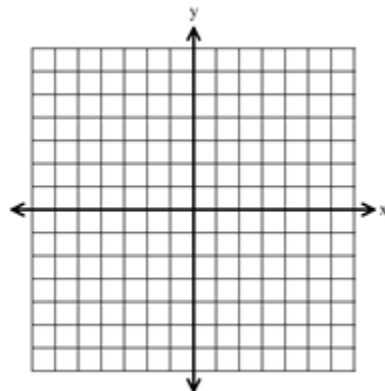
Domain:                  Range:

H.A:

Transformations:

x	y

11.  $f(x) = 5^{x-2}$



Growth or Decay?

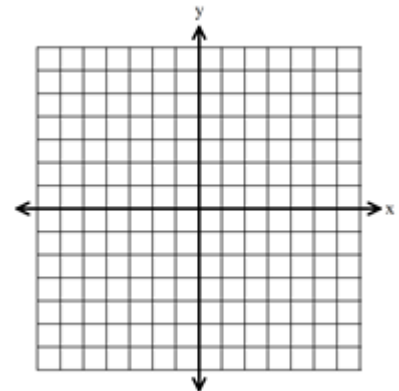
Domain:                  Range:

H.A:

Transformations:

x	y

12.  $y = \left(\frac{1}{2}\right)^{x+5} - 2$



Growth or Decay?

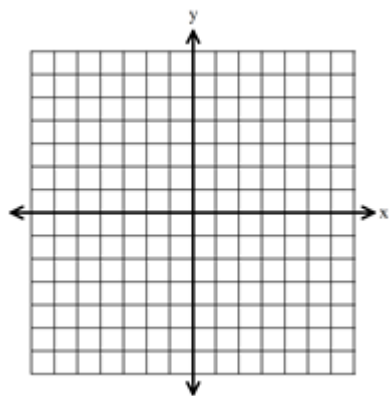
Domain:                  Range:

H.A:

Transformations:

x	y

13.  $g(x) = 2^x + 1$



Growth or Decay?

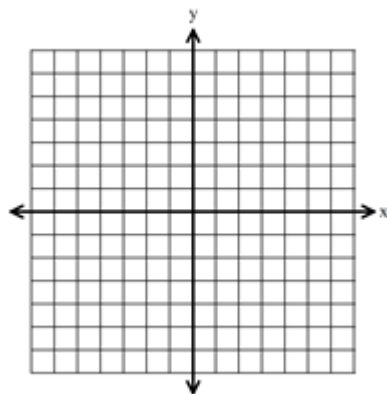
Domain:            Range:

H.A:

Transformations:

x	y

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



Growth or Decay?

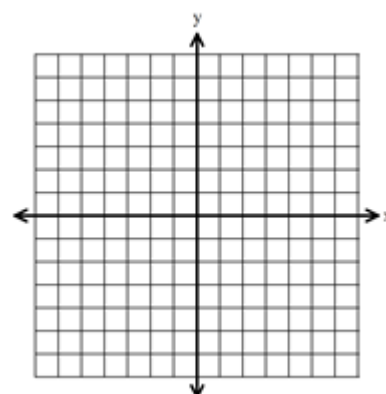
Domain:            Range:

H.A:

Transformations:

x	y

15.  $y = \left(\frac{1}{4}\right)^{x+5}$



Growth or Decay?

Domain:            Range:

H.A:

Transformations:

x	y

For #16 – 17, solve for x.

16.  $3^{2x+3} = 27$

17.  $8^x - 20 = 44$

For #18 – 19, solve the system using substitution or elimination.

18.  $\begin{cases} -3x - 8y = 20 \\ y = 19 + 5x \end{cases}$

19.  $\begin{cases} x - 3y = -3 \\ -7x + 8y = -5 \end{cases}$



For #1 – 3, state all transformations of the function and whether it is growth or decay.

1)  $y = 4\left(\frac{1}{2}\right)^x + 2$

Transformations:
Growth or Decay?

2)  $y = 2 \cdot 3^x + 3$

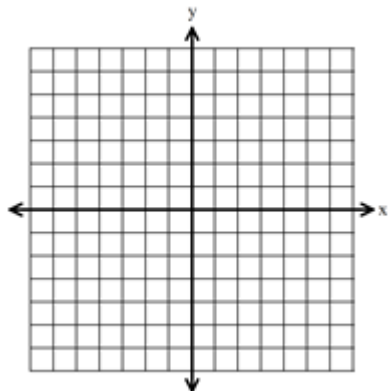
Transformations:
Growth or Decay?

3)  $y = \left(\frac{1}{4}\right)^{x-1} - 2$

Transformations:
Growth or Decay?

For #4 – 9, Graph the following functions. Identify D, R, equation of horizontal asymptote (HA), transformations, and whether it is growth or decay.

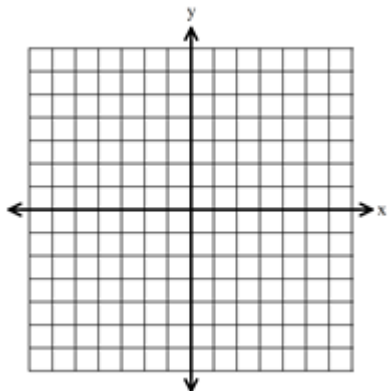
4)  $y = 3^{x-1} + 3$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

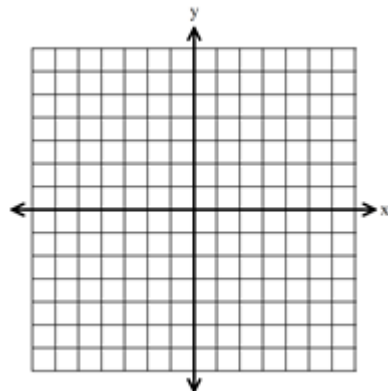
5)  $y = -(0.5)^{x+3} - 1$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

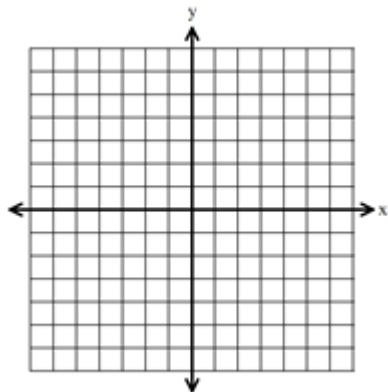
6)  $y = 3 \cdot 2^{x-4} - 5$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

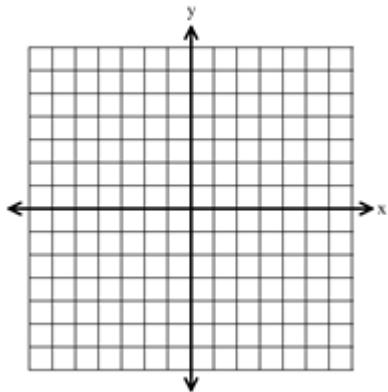
7)  $y = \left(\frac{2}{3}\right)^{x+5} - 1$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

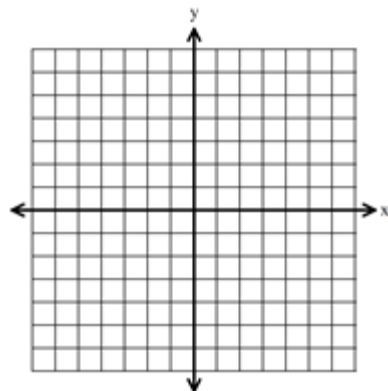
8)  $y = -\left(\frac{3}{4}\right)^{x-1} + 6$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

9)  $y = 4 \cdot 3^{x+1} - 2$



Transformations:

Domain:                  Range:  
H.A.:                      Growth/Decay?

10) How does the graph of  $f(x) = 3^{x+2}$  compare to the graph of  $g(x) = 3^x + 2$ ?

For #11 – 13, simplify using the rules of exponents.

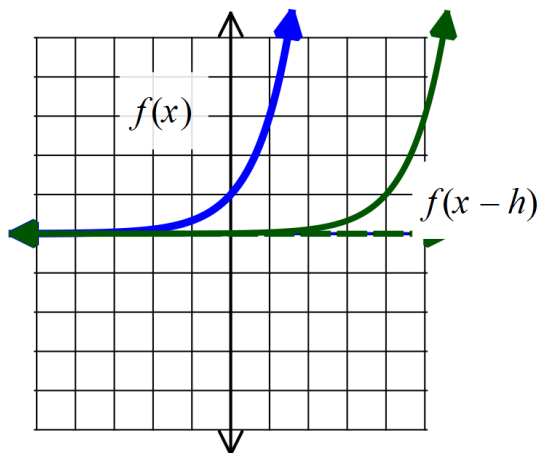
11)  $(x^4)^8$

12)  $\frac{x^{-4}y^3z^{-6}}{x^8y^{-2}}$

13)  $x \cdot x^5 \cdot x^7$

14) Describe how  $g(x) = 2^x$  changes after the transformation  $-3g(x)$  is applied.

15) Given  $f(x)$  and  $f(x - h)$  as graphed, find the value of  $h$ .



# Algebra 1 Worksheet 6.3

Name \_\_\_\_\_ Per \_\_\_\_

For problems #1-6, determine whether the function is exponential. If it is exponential, write an equation for the function in the form  $y = a_0 \cdot (b)^x$

1) 

$x$	0	1	2	3
$y$	2	8	32	128

2) 20, 40, 80, ...

3) 1, 6, 11, ...

4) 

$x$	0	1	2	3
$y$	3	9	27	81

5) 

$x$	0	1	2	3
$y$	100	50	25	12.5

6) -6, -12, -24, ...

7) Write an equation for the exponential function below and find the 7<sup>th</sup> term.

$x$	0	1	2	3
$y$	32	16	8	4

8) Your parents offer you two options to receive an allowance for a 9-week period.

Option 1: You get paid \$25 per week

Option 2: You are paid \$1 the first week, \$2 the second week, \$4 the third week, and so on.

a) Does either option form a geometric sequence? Explain.

b) If you want to receive the most possible money in the 9 week period, which option should you choose? Explain.

For #9 – 11, write the recursive formula for each geometric sequence.

9) 6, 18, 54, 162, ...

10) 4, 8, 16, 32, 64, ...

11)  $\frac{1}{2}, \frac{3}{10}, \frac{9}{50}, \frac{27}{250}, \dots$

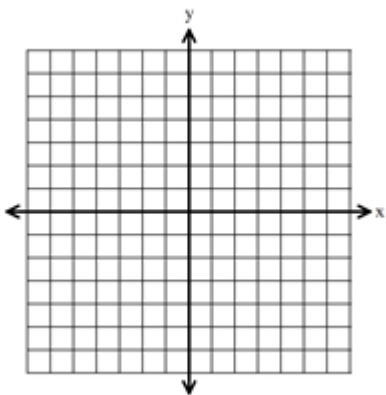
For #12 – 13, simplify each expression using exponent rules.

12)  $\left(-\frac{4}{x^5}\right)^8$

13)  $\frac{b^{12}c^{-4}}{b^{-3}c^{-2}}$

For #14 – 15, Graph the following exponential functions including the horizontal asymptote (HA). Identify D, R, equation of asymptote, transformations, and growth/decay.

14) Graph  $y = 4^{x-2} + 3$



Transformations:

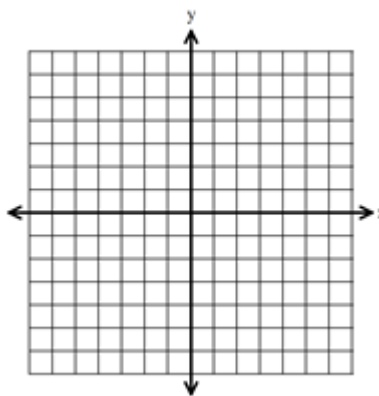
Domain:

Range:

H.A:

Growth/Decay?

15) Graph  $y = \left(\frac{1}{4}\right)^{x+3} - 2$



Transformations:

Domain:

Range:

H.A:

Growth/Decay?

16) Describe how  $g(x) = 5^x$  changes after the transformation  $g(x) + 4$  is applied.

For #17 – 18, solve the system using elimination. Show all your work.

17)  $\begin{cases} 16x - 10y = 10 \\ -8x - 6y = 6 \end{cases}$

18)  $\begin{cases} -7x - 8y = 9 \\ -4x + 9y = -22 \end{cases}$

**Bonus:** Solve for  $x$ . Show your work.

$$49^{3x+8} = 7^{x+6}$$

## Algebra 1 Worksheet 6.4

Name \_\_\_\_\_ Per \_\_\_\_

**For #1-6, Given the exponential function, identify the initial amount  $a$  and the growth/decay factor  $b$ .**

1.  $y = 25(1.20)^x$

Initial amount:

Growth/decay factor:

2.  $f(x) = 1250(.65)^x$

Initial amount:

Growth/decay factor:

3.  $y = 1.17^x$

Initial amount:

Growth/decay factor:

4.  $y = 2(.83)^x$

Initial amount:

Growth/decay factor:

5.  $f(t) = .678 \cdot (1.9)^t$

Initial amount:

Growth/decay factor:

6.  $y = .97^x$

Initial amount:

Growth/decay factor:

**For #7-9, identify if the function is a growth or decay function.**

7.  $f(t) = -2.3 \cdot 5^t$

8.  $f(x) = .15(2)^{-x}$

9.  $y = -3\left(\frac{1}{6}\right)^{-x}$

10. You are given a gift of \$2,500 in stock on your 16<sup>th</sup> birthday. The value of the stock declines by 10% per year.
- Write an exponential decay function that could be used to find the value of the stock  $t$ -years after your 16<sup>th</sup> birthday.
  - What will the value of the stock be on your 21<sup>st</sup> birthday? Round to the nearest cent. (use a calculator)
11. Samantha buys a house for \$125,000. The value of the house increases by 3% each year.
- Write an exponential growth function to model the value of Samantha's house  $t$ -years after she bought it.
  - What is the value of Samantha's house 7 years after she purchased the house? Round to the nearest cent. (use a calculator)
12. You deposit \$500 into a savings account that earns 6% interest each year and you do not make any deposits or withdrawals. How much will the account be worth in 25 years?

13. Jimmy buys a car for \$15,000. The value of the car depreciates by 7% each year.

a) Write an exponential decay function to model the value of Jimmy's car  $t$ -years after he bought it.

b) What is the value of Jimmy's car 4 years after he purchased the car? Round to the nearest cent.  
(use a calculator)

For #14 – 15, simplify each expression using the rules of exponents.

14.  $(-3a^2b)^2 \cdot 6a^5b^4$

15.  $\left(\frac{3y^8}{x^2y^3}\right)^2$

For #16 – 17, solve for the variable.

16.  $3^{5x-11} + 9 = 90$

17.  $\frac{1}{3}(6)^x = 72$

18. Graph:  $y = 5^{x+3} + 3$

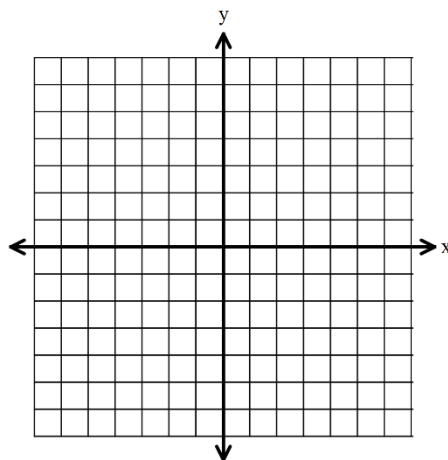
Growth/Decay?

Domain:

Range:

H.A:

Transformations:



# Algebra 1 Chapter 6 Practice Test

Name \_\_\_\_\_ Per \_\_\_\_\_

For #1-4, Graph the Exponential function.

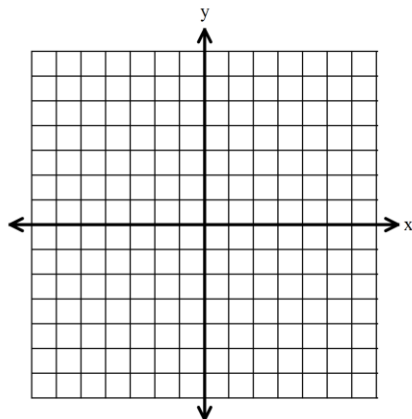
1)  $y = -3^{x+1} - 5$

Domain:

Range:

Transformations:

Growth/Decay?



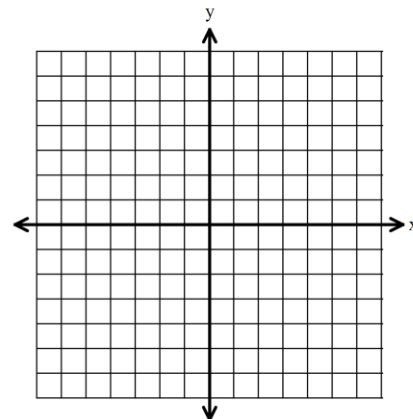
2)  $y = \left(\frac{1}{2}\right)^{x-3} + 2$

Domain:

Range:

Transformations:

Growth/Decay?



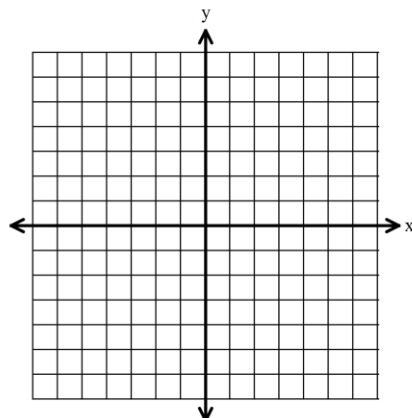
3)  $y = 4 \cdot 2^x + 1$

Domain:

Range:

Transformations:

Growth/Decay?



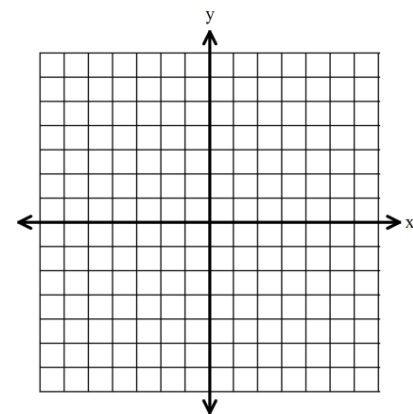
4)  $y = 2 \cdot (3)^{x-4}$

Domain:

Range:

Transformations:

Growth/Decay?



For #5 – 8, Write an equation for the exponential functions.

5)

x	0	1	2	3
y	$-\frac{1}{16}$	$-\frac{1}{4}$	-1	-4

6) 3, 6, 12, 24, ...

7)

x	0	1	2	3
y	25	5	1	$\frac{1}{5}$

8)  $\frac{7}{2}, 14, 56, \dots$

**For #9 – 10:** Sam buys a car for \$55,000. The value of the car depreciates at a rate of 12% per year. Use a calculator when needed.

- 9) Write an exponential equation to model the situation.
- 10) What will the value of the car be 4 years after Sam purchases the car?

**For #11 – 12:** Dan buys a rare car at auction for \$35,000. The value of the car increases by 12.5% per year. Use a calculator when needed.

- 11) Write an exponential equation to model the situation.
- 12) What will the value of the car be 5 years after Dan purchases the car?

**For #13 – 14:**  $g(x) = 900(.65)^x$

- 13) Does the function  $g(x)$  represent exponential growth or decay?
- 14) What is the growth **factor** or decay **factor** for  $g(x)$ ?

**For #15 – 17:**  $f(x) = 657(1.42)^x$

- 15) Does the function  $f(x)$  represent exponential growth or decay?
- 16) What is the growth **factor** or decay **factor** for  $f(x)$ ?
- 17) What is the initial amount for  $f(x)$ ?



**For problems #18 – 23, solve the equation.**

18)  $4^x = 64$

19)  $9^x = 81$

20)  $7^{3x} = 7^{x+8}$

21)  $\frac{1}{4}(4)^x = 4$

22)  $49^{3x} = 7^{4x+8}$

23)  $6^{3x-1} = 36^{3x-5}$

**For problems #24 – 27, simplify using the rules of exponents.**

24)  $(y^8)^5$

25)  $x^3 \cdot x^4 \cdot x^6$

26)  $\frac{x^{-2}y^5z^{-2}}{x^8y^{-2}z^{-6}}$

27)  $(2x^5y^4)^3 \cdot 2xy$