

10.1 Homework

Name _____

Simplify each expression.

1) $(a^2b)^5$

2) $(a^3bc^3)^4(ab^5)^2$

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

4) $\frac{3^5 \cdot 9}{3^{13}}$

5) $\frac{6^8}{36^4 \cdot 6^{20}}$

6) $x^{-3}(xy^2)^3$

7) $\left(\frac{a^{-4}}{ba^3}\right)^5$

8) $(-15fg^{-2})^0$

9) $(2x^{-2}y^3)^{-2}$

10) $\frac{36m^{-4}n^6}{4mn^{-2}p^{-4}}$

11) $\frac{2w^{-3}x^{-2}}{(2wx)^2}$

12) $\left(\frac{2x^3}{y^{-5}}\right)^3 \cdot \frac{1}{6x^3}$

13) $7e^3 \cdot 9e^5$

14) $\frac{27e^8}{3e^2}$

15) $(-5e^{-3x})^3$

16. How can you obtain the graph of $g(x) = \frac{1}{x-2}$ from the graph of $f(x) = \frac{1}{x}$?

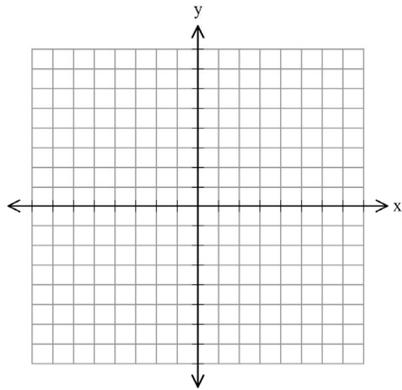
17. Solve the following system to find the **y-coordinate** of the solution:

$$y = 2x^2 - 6x + 7$$

$$y = 5x - 5$$

Graph each function. Describe the transformation from its parent function. State the domain, range, & end behavior.

18. $f(x) = \sqrt[3]{x + 2} - 3$

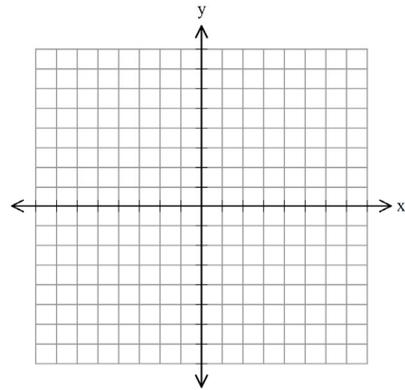


Transformation:

D: R:

End:

19. $g(x) = \frac{2}{x+1} + 3$

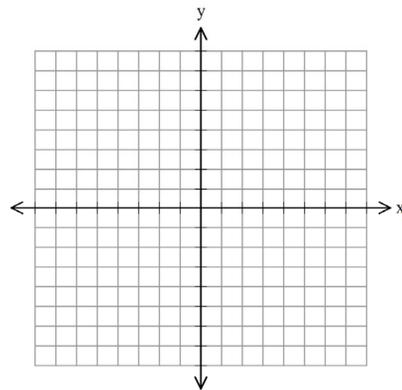


Transformation:

D: R:

End:

20. $k(x) = 2\sqrt{x - 2}$



Transformation:

D: R:

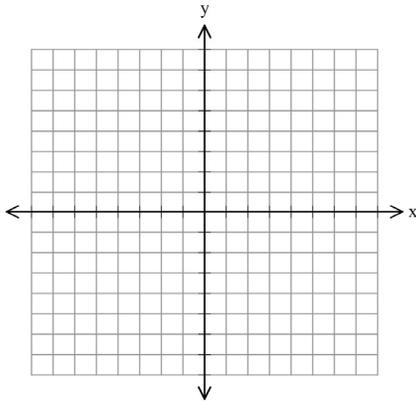
End:

10.2 Homework

Name _____

Graph each exponential function. Describe the domain & range.

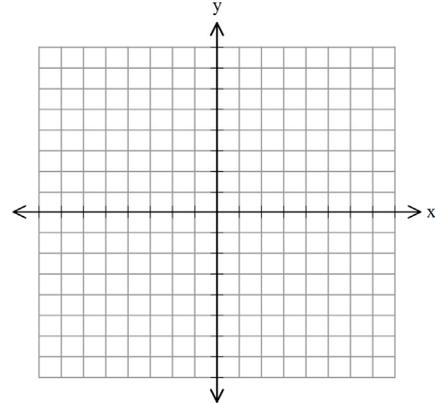
1. $y = -4 \cdot 2^x$



Domain:

Range:

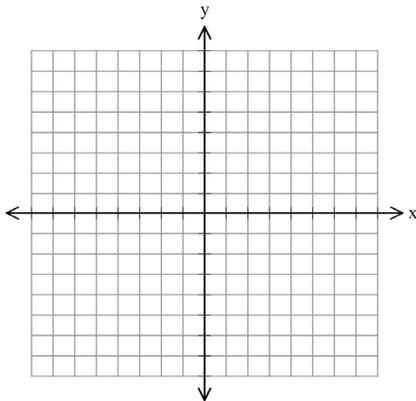
2. $y = 2 \cdot 3^{x-2} + 1$



Domain:

Range:

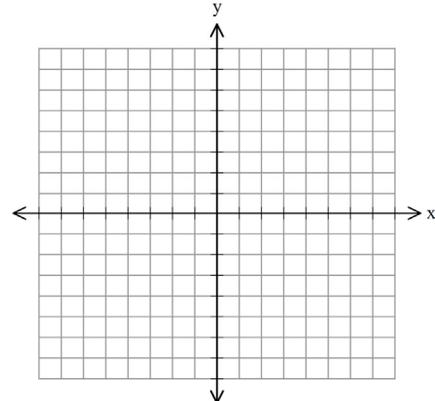
3. $y = -2^{x+3} + 4$



Domain:

Range:

4. $y = 3 \cdot 4^x + 2$

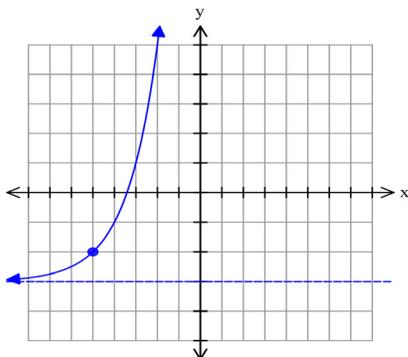


Domain:

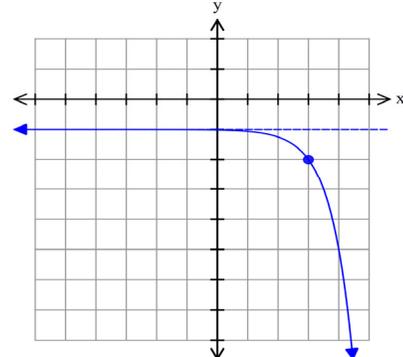
Range:

Write an equation of the exponential function $g(x)$ whose graph is given.

5.



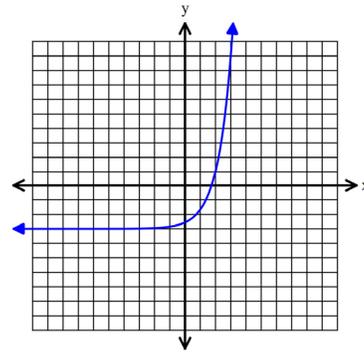
6.



7. When evaluating the function $f(x) = 2^{x-1} - 3$ for any real number x , what must be true about the value of $f(x)$?
- A. The value of $f(x)$ is always greater than 1 C. The value of $f(x)$ is always greater than -3
 B. The value of $f(x)$ is always less than 1 D. The value of $f(x)$ is always less than -3
8. Alicia graphed an exponential function that has a y -intercept of 3. Which of the following functions could she have graphed?
- A. $g(x) = 5^{x-3}$ B. $g(x) = 5^x + 3$
 C. $g(x) = 3(5)^x$ D. $g(x) = 5^{3x}$

9. Which equation is represented by the graph below?

- A. $y = 4 \cdot 3^{x-2} - 3$
 B. $y = 4 \cdot 3^{x-2} + 3$
 C. $y = 3 \cdot 4^{x-2} - 3$
 D. $y = 3 \cdot 4^{x-2} + 3$



10-12: Simplify each expression.

10. $(3x^{-5}y^3)^4$

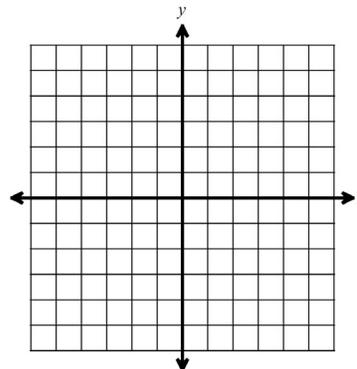
11. $\left(\frac{a^3}{b^{-5}}\right)^8$

12. $\frac{(r^3s^{-4})^5}{r^8s^{-2}}$

13. Which quadrant contains the solution region created by the following system?

$$\begin{cases} y \geq -4 \\ y \leq 2x + 3 \\ y \leq -x - 4 \end{cases}$$

- A. Quadrant I
 B. Quadrant II
 C. Quadrant III
 D. Quadrant IV



14. What are the x -coordinates of the solution for the system given below?

$$\begin{cases} x^2 + 10x + 6y + 8 = 13 \\ 2x + 3y = 7 \end{cases}$$

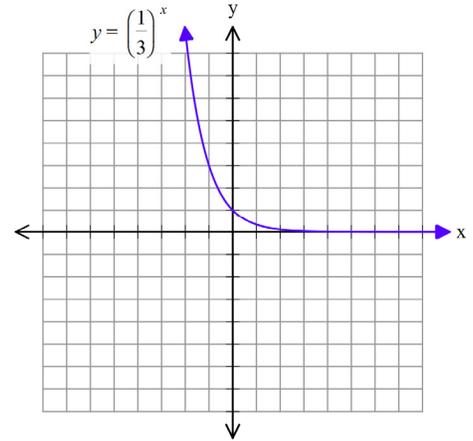
10.3 Homework

Name _____

The graph $f(x) = \left(\frac{1}{3}\right)^x$ is shown. Write the equation for the functions $g(x)$ & $h(x)$ after the given transformations. Then graph & label the functions on the graph provided.

1. The graph of $g(x)$ is the translation of $f(x)$ down 1 and a vertically reflected.

2. The graph of $h(x)$ is a vertical stretch of $f(x)$ by a factor of 4 and is translated 5 units right.



Determine if the following functions are examples of exponential growth or exponential decay.

3. $f(x) = 0.25(5)^x$

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

5. $f(x) = 2 \cdot e^{-x}$

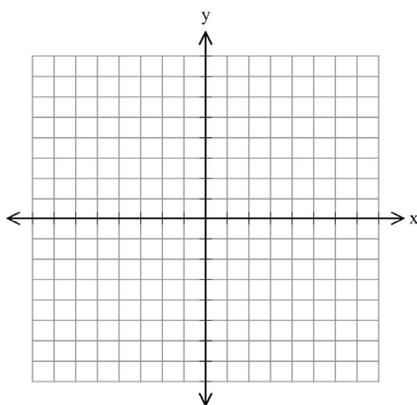
6. $f(x) = \left(\frac{5}{2}\right)^x$

7. $f(x) = 0.75 \cdot 4^x$

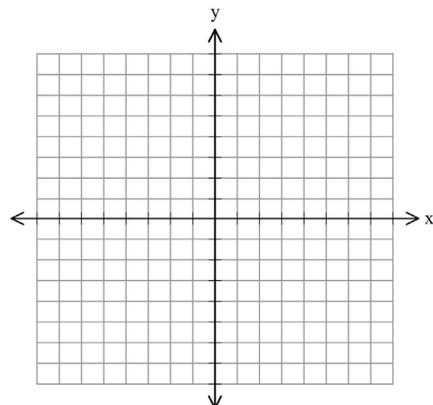
8. $f(x) = \frac{1}{2}(e)^x$

Graph each exponential function. Describe the domain & range.

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



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



Domain:	Domain:
Range:	Range:

11. How would you translate the graph of $f(x) = e^x$ to produce the graph of $f(x) = 2e^x + 1$?

12. As x approaches infinity, the graph of which function rises at the fastest rate?

A. $f(x) = 3^x$

B. $g(x) = -8^x$

C. $h(x) = 5^x$

D. $k(x) = \frac{3^x}{2}$

13. Alicia graphed an exponential function that has a y -intercept of 5. Which of the following functions could she have graphed?

A. $g(x) = 2^{x-5}$

B. $g(x) = 5 \cdot 2^x$

C. $g(x) = 3^x + 5$

D. $g(x) = 5^x$

14. Describe the domain & range for $y = -3 \cdot 2^{x+4} - 1$

15. What are the x -coordinates of the solution for the system given below?

$$\begin{cases} x^2 + 14x + 3y + 1 = 10 \\ 3x + y = -5 \end{cases}$$

16. If the function $f(x) = \frac{1}{2}\sqrt{x+2} - 1$ were translated down five (5) units and right three (3) units, what would the resulting function be?

17. State the Domain and Range of the function: $g(x) = 3 + \sqrt{x-5}$

A. Domain: $\{x|x \geq -3\}$
Range: $\{y|y \geq 5\}$

C. Domain: $\{x|x \geq -5\}$
Range: $\{y|y \geq 0\}$

B. Domain: $\{x|x \geq 5\}$
Range: $\{y|y \geq 3\}$

D. Domain: $\{x|x \geq 5\}$
Range: $\{y|\text{all real numbers}\}$

18. Which of the following equations represent exponential decay?

I.	$y = 3 \cdot e^{-x}$
II.	$y = \frac{1}{2} \cdot e^x$
III.	$y = 0.75 \cdot 4^x$
IV.	$y = 6 \cdot 4^{-x}$

A. I and II

C. II and III

B. III and IV

D. I and IV

10.4 Homework

Name _____

Write each of the following exponential functions as the same function with a different base.

1. $f(x) = 81^x$

2. $f(x) = 5^{3x}$

3. $f(x) = 36^x$

Simplify each expression.

4. $5^{2/3} \cdot 5^{5/6}$

5. $\frac{8^2}{2^5}$

6. $(9x^4)^{5/3}$

7. $\frac{x^{7/5}y^{1/3}}{x^{2/5}y^{4/3}}$

8. $a^{2/3} \cdot b^{3/4} \cdot a^{2/3} \cdot \sqrt[4]{b}$

9. $\left(\frac{x^{1/4}y^{3/4}z^{5/3}}{x^{5/4}y^{1/4}z^{1/3}}\right)^3$

10. Which of the following functions are examples of exponential decay? Circle all that apply

A. $f(x) = 0.5(1.2)^x$

B. $g(x) = 0.86x^{2.4}$

C. $h(x) = 1.2e^{-x} + 0.5$

D. $k(x) = 2.4(0.86)^x$

11. Which of the following is a vertical stretch by a factor of 3 and is translated 4 units right from the graph of $f(x) = 2^x$.

A. $f(x) = 2^{x-4} + 3$

B. $f(x) = 3(2)^{x-4}$

C. $f(x) = 2^{x-3} + 4$

D. $f(x) = 3(2)^x + 4$

12. Describe the transformation of the parent function $f(x) = e^x$ to $f(x) = -\frac{1}{2}e^x + 1$.

13. Which of the following functions is an example of exponential growth?

A. $f(x) = 0.5(1.2)^x$

B. $g(x) = 0.86x^{2.4}$

C. $h(x) = 1.2x + 0.5$

D. $k(x) = 2.4(0.86)^x$

14. When evaluating the function $f(x) = -3^x + 5$ for any real number x , what must be true about the value of $f(x)$?

A. The value of $f(x)$ is always negative

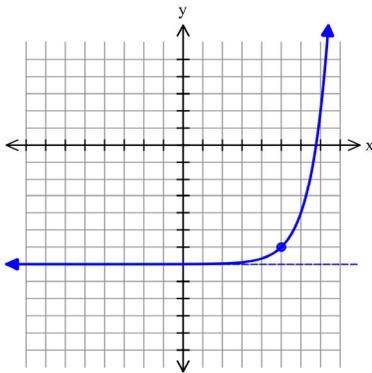
C. The value of $f(x)$ is always greater than 5

B. The value of $f(x)$ is always positive

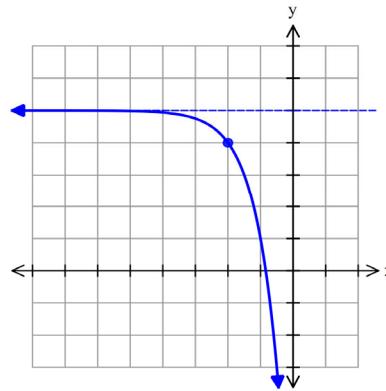
D. The value of $f(x)$ is always less than 5

Write an equation of the exponential function $g(x)$ whose graph is given.

15.



16.



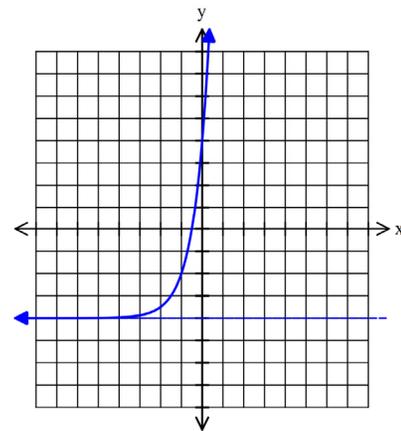
17. Which equation is represented by the graph below?

A. $y = 4 \cdot 2^{x+1} - 4$

B. $y = 4 \cdot 2^{x+5} + 1$

C. $y = 2 \cdot 4^{x+1} - 4$

D. $y = 2 \cdot 4^{x+5} + 1$



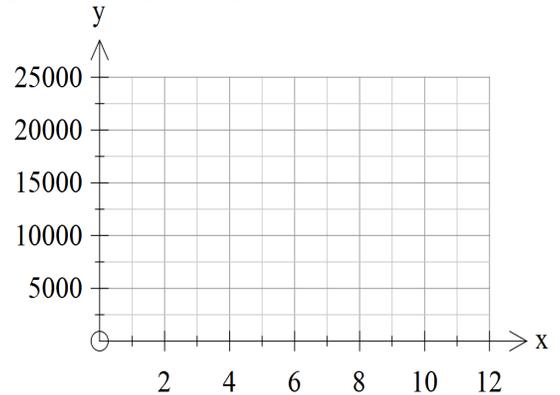
18. If the function $f(x) = 2\sqrt{x-2} - 3$ were translated left 4 units and up 5 units, what would the resulting function be?

10.5 Homework

Name _____

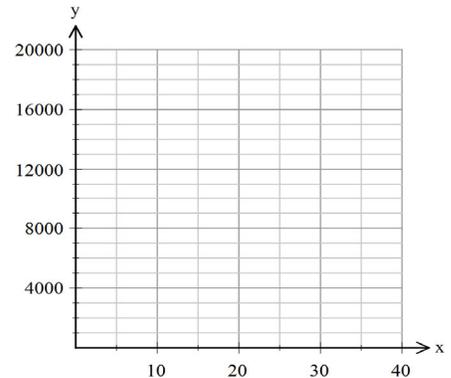
A car sells for \$22 000 and is known to depreciate at a rate of approximately 11% per year.

1. Graph the function.
2. Is this exponential growth or exponential decay.
3. Write the function that gives the balance after t years.
4. Find the balance after 6 years.



Daniel invested \$6500 in an account that earns interest at a rate of 3.2% compounded annually.

5. Graph the function.
6. Write the function that gives the balance after t years.
7. Find the balance after 10 years.



8. A \$2500 investment has grown by 4.5% compounded monthly for 12 years. What is the value of the investment? Use $A(t) = P \left(1 + \frac{r}{n}\right)^{nt}$
9. An initial population of 900 frogs decreases at a rate of 14% per year. Which function gives the population after x years?

A. $f(x) = 900(1.14)^x$	B. $f(x) = 900(0.14)^x$
C. $f(x) = 900(0.86)^x$	D. $f(x) = 900 - (0.86)^x$
10. You want to invest \$1000 in a savings account. The bank gives you two options below to choose from. Which option would yield the highest return on your investment?

Option A	Option B
Interest compounded quarterly $A = P \left(1 + \frac{r}{n}\right)^{nt}$ Rate: 3.5% for 5 years	Interest compounded continuously $A = Pe^{rt}$ Rate: 3.45% for 5 years

11. Ty evaluates the function $f(x) = 2^x + 1$, for all real number x . What must be true for the value $f(x)$?
- The value of $f(x)$ must be greater than 2
 - The value of $f(x)$ must be greater than 1
 - The value of $f(x)$ must be less than 2
 - The value of $f(x)$ must be less than 1.
12. Describe the domain and range of $y = 3 \cdot 4^{x+5} - 2$

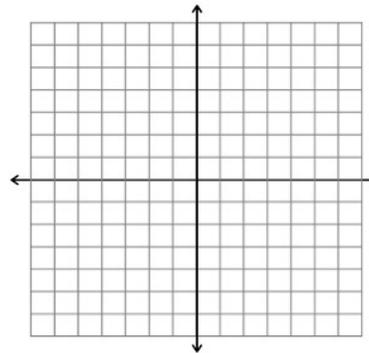
#13-14: *Simplify each expression.*

13. $\left(\frac{2x^4 \cdot 5y^3}{(2x)^3}\right)^{-2}$

14. $(2a^3bc^3)^{-3}(a^{-2}b^5)^2$

15. Graph: $y = -\left(\frac{1}{2}\right)^{x+2} + 6$

State the Domain and Range.



16. Which of the following expressions simplifies to $y^2 \cdot \sqrt{y}$?

A. $\frac{\sqrt{y^7}}{\sqrt{y^5}}$

C. $\frac{y^{1/3}y^{3/2}}{y^{1/2}}$

B. $\frac{(4x^{3/2}y^{1/4})^2}{(2x^{3/4}y^{-1/2})^4}$

D. $\frac{\sqrt{9x^7y^2}}{3\sqrt{xy}}$

17. If the function $f(x) = -2\sqrt{x-1} + 3$ were translated left three (3) units and down four (4) units and reflected vertically, what would the resulting function be?

10.6 Homework

Name _____

Solve for the value of x. Check your solutions.

1) $2^{3x+2} = 2^{8x-13}$

2) $3^{x-1} = 243$

3) $5^{4x+8} = 5^{x-7}$

4) $4^{3x-6} = 8^{5x+2}$

5) $100^{3x} = 10^{5x-9}$

6) $e^{4x-1} = e^{x+11}$

7) $27^{4x} = 81^{2x-1}$

8) $\left(\frac{1}{125}\right) = 5^{3x-12}$

9) $27^{3x-1} = \left(\frac{1}{9}\right)^{x-4}$

10. Which of the following would NOT produce the same graph as $g(x) = 256^x$?

A. $h(x) = 2^{8x}$

C. $h(x) = 8^{3x}$

B. $h(x) = 4^{4x}$

D. $h(x) = 16^{2x}$

11. Which of the following equations represent exponential decay?

I.	$y = 5 \cdot e^{-6x}$	III.	$y = 0.75 \cdot 3^{2x}$
II.	$y = \frac{1}{3} \cdot e^{3x}$	IV.	$y = 2 \cdot 5^{-4x}$

A. I and II

C. II and III

B. III and IV

D. I and IV

12. A microbiologist is studying a bacteria culture and determines that the population can be modeled by the equation $P = 256 \cdot e^{0.43t}$, where t is the time elapsed in hours. If the microbiologist begins an experiment at 8:00 *am*, what will the bacteria population be at 12:30 *pm*? Round to the nearest whole number.

13. Which of the following is a vertical stretch by a factor of 4 and is translated 2 units down from the graph of $f(x) = 3^x$?

A. $f(x) = 3^{x-2} + 4$

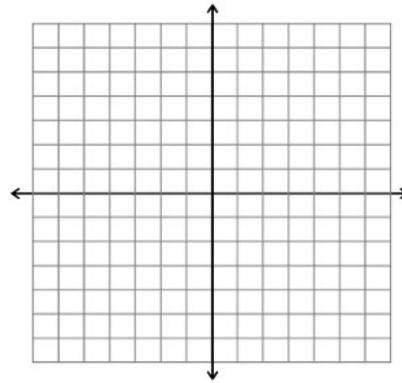
B. $f(x) = 4(3)^x - 2$

C. $f(x) = 4^{x-3} + 3$

D. $f(x) = 3(4)^{x-2}$

14. Graph: $y = \left(\frac{1}{3}\right)^{x-4} + 1$

State the Domain and Range.



15. Simplify: $\left(\frac{a^{1/4}b^{5/3}c^{7/5}}{a^{3/4}b^{2/3}c^{2/5}}\right)^2$

16. Write an exponential function in the form $y = ab^x$ whose graph passes through the points (2, 8) and (3, 32).

Chapter 10 Practice Test

Name _____

For #1-3, simplify. No decimals or negative exponents. Show your work!

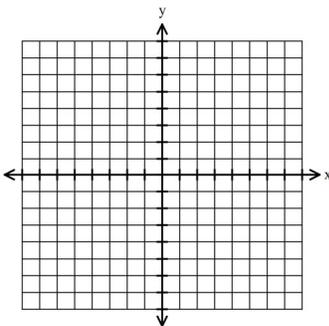
1. $\frac{3^2 \cdot 9^4}{3^5}$

2. $\frac{(2ab^3)^{-2}}{3a^{-4} \cdot (3a^3b^2)^2}$

3. $\frac{(x^{-3}y^4)^3}{x^2y^3}$

#4-9: Graph the exponential function. State the domain and range for each function.

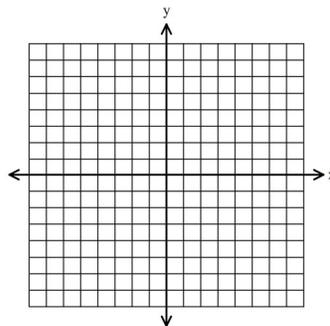
4. $y = 2^{x+1}$



Domain:

Range:

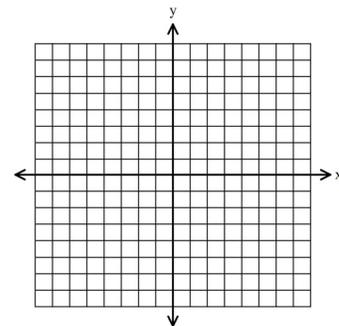
5. $y = -4^x$



Domain:

Range:

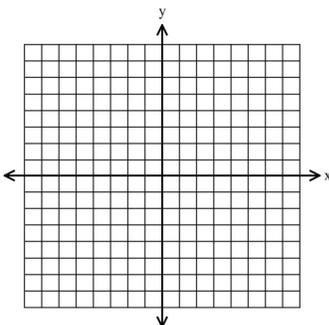
6. $f(x) = 3 \cdot 2^{x+1} - 4$



Domain:

Range:

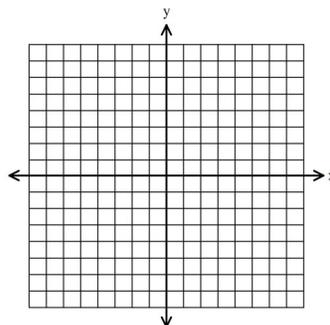
7. $f(x) = \left(\frac{1}{2}\right)^{x-2} + 1$



Domain:

Range:

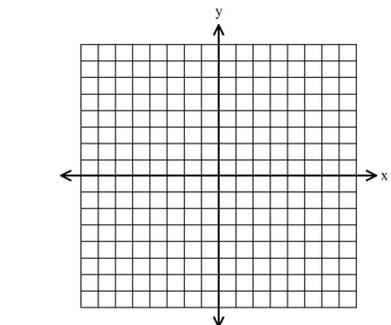
8. $y = -e^x - 3$



Domain:

Range:

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



Domain:

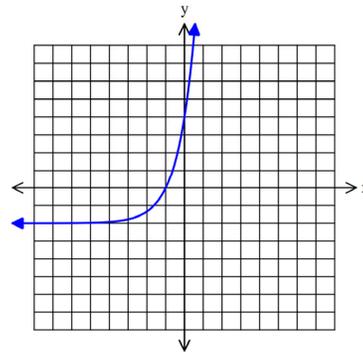
Range:

10. The graph $f(x) = 3^x$ is translated left 4 units, up 2 units, and is reflected across the x -axis. What is the equation of the function after the transformation?

11. The graph $f(x) = 4^x$ has a vertical stretch by a factor of 2 and is reflected vertically. What is the equation of the function after the transformation?
12. Describe in words how the graph of $g(x) = -4^{x-1} + 3$ would be transformed from the parent function $f(x) = 4^x$.

13. Which equation is represented by the graph below?

- A. $y = 2 \cdot 3^{x+1} - 2$
 B. $y = 2 \cdot 3^{x-2} + 1$
 C. $y = 3 \cdot 2^{x+1} - 2$
 D. $y = 3 \cdot 2^{x-2} + 1$



14. When evaluating the function $f(x) = -2^x - 4$ for any real number x , what must be true about the value of $f(x)$?
- A. The value of $f(x)$ is always negative
 B. The value of $f(x)$ is always positive
 C. The value of $f(x)$ is always greater than 4
 D. The value of $f(x)$ is always less than 4

For #15-17: Solve for x .

15. $3^{2x+1} = 3^{4x-5}$

16. $36^{3x} = \frac{1}{216}$

17. $2^{4x+4} = 16^{3x-1}$

For #18-20: Simplify.

18. $\frac{3^3 \cdot 9^2}{27}$

19. $\frac{x^{6/4} y^{4/3}}{x^{1/4} y^{1/3}}$

20. $\frac{(4 a^{4/3} b^{3/4})^2}{(3 a^{1/3} b^{1/2})^3}$

21. Which of the following would NOT produce the same graph as $g(x) = 4096^x$?

A. $h(x) = 64^{2x}$

C. $h(x) = 4^{6x}$

B. $h(x) = 8^{4x}$

D. $h(x) = 2^{10x}$

#22-25: Determine if the following functions are examples of exponential growth or exponential decay.

22. $f(x) = 4(5)^{-x}$

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

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

25. $f(x) = 0.75 \cdot e^x$

26. An initial population of 900 frogs decreases at a rate of 14% per year. Which function gives the population after x years?

A. $f(x) = 900(1.14)^x$

B. $f(x) = 900(0.14)^x$

C. $f(x) = 900(0.86)^x$

D. $f(x) = 900 - (0.86)^x$

#27-28: Use the Growth & Decay Formula.

27. Paul invests \$3700 at 5.5% compounded annually. Write a function that represents the amount in Paul's account at the end of t years. Then find out how much money Paul will have after 4 years. Use $A(t) = P(1 + r)^t$
28. There are 8500 bacteria in a culture and the bacteria decrease 23% per hour. If a scientist begins decreasing the bacteria at 9:00 am, then how much bacteria will still remain at 1:45 pm? Round your answer to the nearest whole number.
29. You want to invest \$1500 in a savings account. The bank gives you two options below to choose from. Which option would yield the highest return on your investment? Show all work for both options.

Option A	Option B
Interest compounded monthly $A = P \left(1 + \frac{r}{n} \right)^{nt}$ Rate: 4.5% for 5 years	Interest compounded continuously $A = Pe^{rt}$ Rate: 5% for 4 years

30. If the function $f(x) = \frac{1}{3}\sqrt{x} + 2$ were translated left four (4) units and down five (5) units and reflected vertically, what would the resulting function be?
31. Write an exponential function in the form $y = ab^x$ whose graph passes through the points (2, 12.5) and (4, 312.5).