Algebra 2 **Exponential Review**

For #1-2, simplify. Show your work!

1. a) $\frac{x^2}{x^6}$ $\frac{1}{x^4}$

b) $n^3 \cdot (n^2)^4$ $n^3 \cdot n^8$ n^{11}

c) $(7a^5b)^2 \cdot 3b^4$ $7^2a^{10}b^2 \cdot 3b^4$ $49a^{10}b^2 \cdot 3b^4$ $147a^{10}b^6$

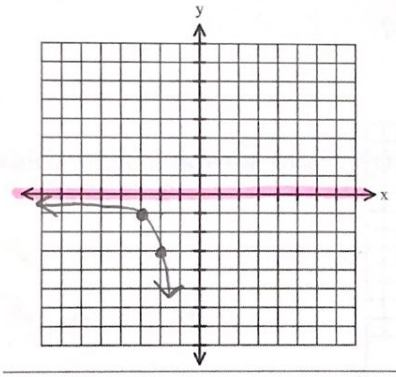
2.a) $\left(\frac{x^2}{3y^3}\right)^2$ $\frac{x^4}{3^2y^6} = \frac{x^4}{9y^6}$

b) $\frac{(-3x^{-5}y^4)^3}{x^{-3}y^6}$ $\frac{-3^3x^{-15}y^{12}}{x^{-3}y^6} = \frac{-27x^3y^{12}}{x^{15}y^6} = \frac{-27y^6}{x^{12}}$

#3-6: Graph the exponential function. State the domain and range for each function.

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

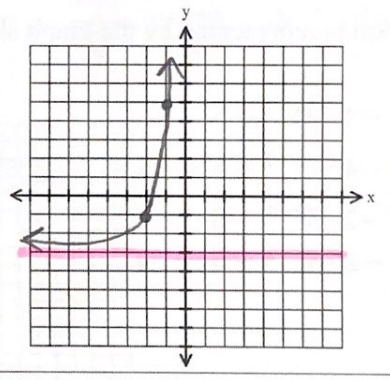
$a=-1$
$b=3$
$h=-3$
$k=0$



D: $\mathbb{R}$ R: $y<0$

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

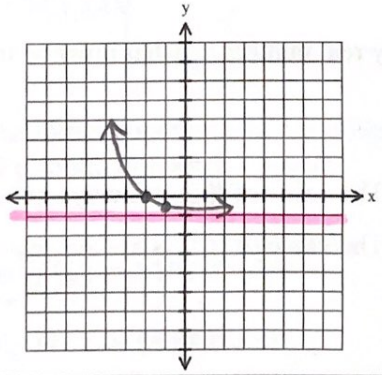
$a=2$
$b=4$
$h=-2$
$k=-3$



D: $\mathbb{R}$ R: $y>-3$

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

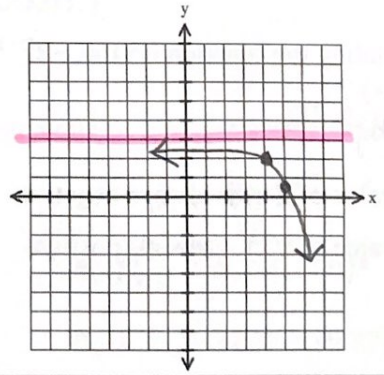
$a=1$
$b=1/2$
$h=-2$
$k=-1$



Domain: $\mathbb{R}$
Range: $y>-1$

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

$a=-1$
$b=2.7$
$h=4$
$k=3$



Domain: $\mathbb{R}$
Range: $y<3$

7. The graph $f(x) = 4^x$ is translated left 5 units and down 6 units.
What is the equation of the function after the transformation?

$f(x) = 4^{x+5} - 6$

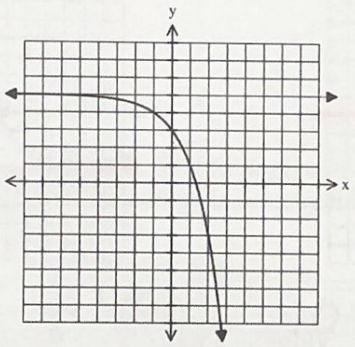
8. The graph $f(x) = 2^x$ has a vertical stretch of by a factor of 5 and is reflected vertically.
What is the equation of the function after the transformation?

$f(x) = -5 \cdot 2^x$

9. Describe how the graph of $g(x) = -\left(\frac{1}{3}\right)^{x-1} - 3$ would be transformed from the parent function $f(x) = \left(\frac{1}{3}\right)^x$. reflected, right 1, down 3

10. Which equation is represented by the graph shown below?

(A.) $y = -4 \cdot 2^{x-1} + 5$
~~B.~~ $y = -4 \cdot 2^{x-1} - 5$
~~C.~~ $y = -2 \cdot 3^{x-1} + 5$
~~D.~~ $y = -2 \cdot 3^{x-1} - 5$



11. When evaluating the function $f(x) = -2^{x-1} + 4$ for any real number x, what must be true about the value of f(x) ?
Range HA

~~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 #12-13: Solve for x.

12.a) $2^{3x+2} = 2^{8x-13}$

$3X+2=8X-13$

$-3X+13 \quad -3X+13$

$\frac{15}{5} = \frac{5X}{5} \quad X=3$

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

$4X-1=X+11$

$-X+1 \quad -X+1$

$\frac{3X}{3} = \frac{12}{3} \quad X=4$

13.a) $8^{3x} = \frac{1}{32}$

$(2^3)^{3X} = 2^{-5}$

$\frac{9X}{9} = \frac{-5}{9} \quad X=-5/9$

b) $64^{2x+1} = 256^{x-4}$

$(4^3)^{2X+1} = (4^4)^{X-4}$

$6X+3=4X-16$

$-4X-3 \quad -4X-3$

$\frac{2X}{2} = \frac{-19}{2} \quad X=-9.5$

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

A. $h(x) = 4^{4x}$ C. $h(x) = 8^{3x}$

B. $h(x) = 16^{2x}$ D. $h(x) = 2^{8x}$

#17-19: Determine if the following functions are examples of exponential growth or decay.

17. $f(x) = 3(0.86)^x$ decay

18. $f(x) = e^{4x}$ growth

19. $f(x) = (6)^{-x}$ decay

20. An initial population of 1400 flies decreases at a rate of 23% per year. Which function gives the population after x years?

A. $f(x) = 1400(0.77)^x$ B. $f(x) = 0.23(1400)^x$

C. $f(x) = 1400(0.23)^x$ D. $f(x) = 1400 - (0.77)^x$

#22-23: Sara invests $5400 at 4.3% compounded annually.

22. Write a function that represents the amount in Sara's account at the end of t years.
Use $A(t) = P(1+r)^t$ $A(t) = 5400(1+.043)^t$

23. Find out how much money Sara will have after 7 years.
$5400(1+.043)^7 = \$7250.74$

#24-25: A microbiologist is studying bacteria culture, with an initial population of 562. He determines that the bacteria decays at a rate of 28% per hour.

24. Write a function that represents the amount of the bacteria population after t hours.
$A(t) = 562(1-.28)^t$

25. If the microbiologist begins his study at 9:30 am, what will the bacteria population be at 5:00 pm? Round your answer to the nearest whole number.
$562(1-.28)^{7.5} = \$47.83$

26. You want to invest $\$4600$ (P) in a savings account. The bank gives you three options below to choose from. Which option would yield the highest return on your investment? You must show all work for all three options for credit.

Option A	**Option B**	**Option C**
Interest compounded quarterly $A = P\left(1+\frac{r}{n}\right)^{nt}$ Rate: 2.5% for 4 years	Interest compounded monthly $A = P\left(1+\frac{r}{n}\right)^{nt}$ Rate: 3.5% for 3 years	Interest compounded continuously $A = Pe^{rt}$ Rate: 2.5% for 3 years
$A = 4600\left(1+\frac{.025}{4}\right)^{4\cdot4}$ $A = 5082.20$ $\$5082.20$	$A = 4600\left(1+\frac{.035}{12}\right)^{12\cdot3}$ $A = 5108.49$ $\$5108.49$	$A = 4600e^{(.025\cdot3)}$ $A = 4958.27$ $\$4958.27$