Name: _____ Date: _____

EXPONENTIAL FUNCTION BASICS
COMMON CORE ALGEBRA II

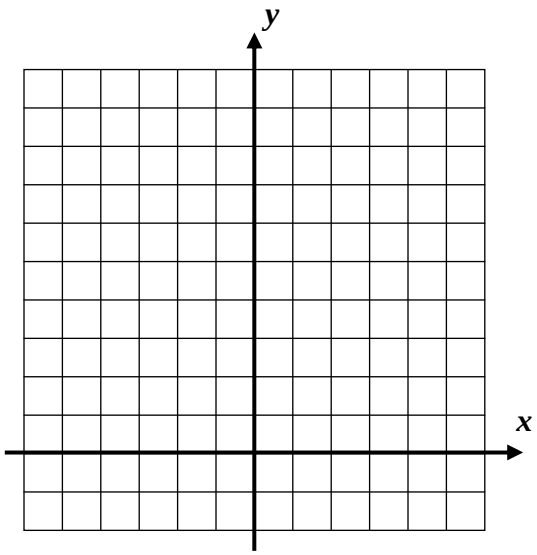
You studied exponential functions extensively in Common Core Algebra I. Today's lesson will review many of the basic components of their graphs and behavior. Exponential functions, those whose exponents are variable, are extremely important in mathematics, science, and engineering.

BASIC EXPONENTIAL FUNCTIONS

$y = b^x$ where $b > 0$ and $b \neq 1$

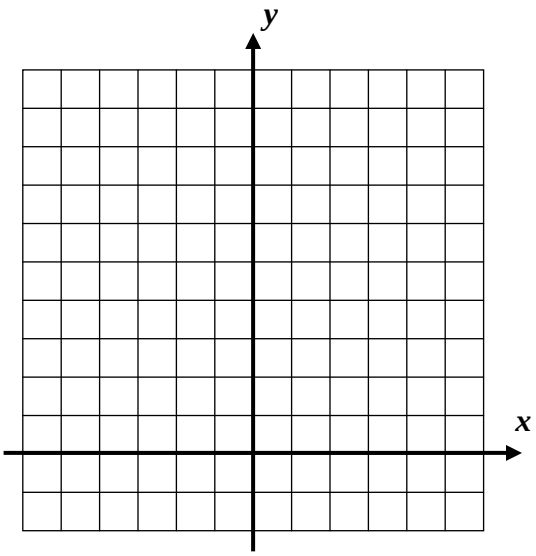
***Exercise* #1:** Consider the function $y = 2^x$. Fill in the table below without using your calculator and then sketch the graph on the grid provided.

x	$y = 2^x$
–3	
–2	
–1	
0	
1	
2	
3	



***Exercise* #2:** Now consider the function $y = \left(\frac{1}{2}\right)^x$. Using your calculator to help you, fill out the table below and sketch the graph on the axes provided.

x	$y = \left(\frac{1}{2}\right)^x$
–3	
–2	
–1	
0	
1	
2	
3	



***Exercise* #3:** Based on the graphs and behavior you saw in *Exercises* #1 and #2, state the domain and range for an exponential function of the form $y = b^x$.

Domain (input set): Range (output set):

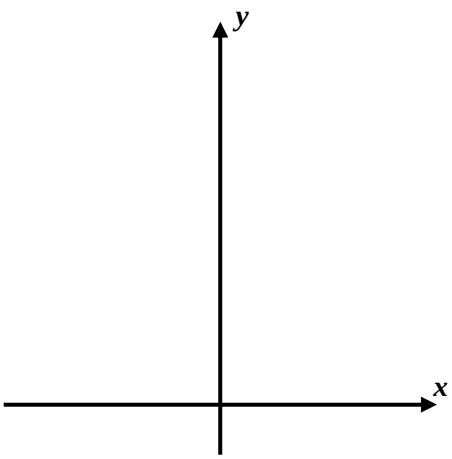
***Exercise* #4:** Are exponential functions one-to-one? How can you tell? What does this tell you about their inverses?

***Exercise* #5:** Now consider the function $y = 7(3)^x$.

(a) Determine the *y*-intercept of this function algebraically. Justify your answer.

(b) Does the exponential function increase or decrease? Explain your choice.

(c) Create a rough sketch of this function, labeling its *y*-intercept.

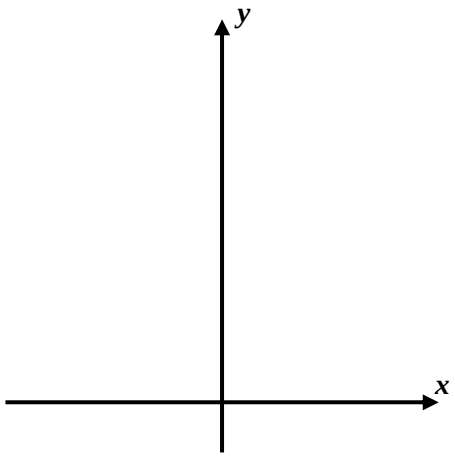


***Exercise* #6:** Consider the function $y = \left(\frac{1}{3}\right)^x + 4$.

(a) How does this function's graph compare to that of $y = \left(\frac{1}{3}\right)^x$? What does adding 4 do to a function's graph?

(b) Determine this graph's *y*-intercept algebraically. Justify your answer.

(c) Create a rough sketch of this function, labeling its *y*-intercept.



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EXPONENTIAL FUNCTION BASICS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Which of the following represents an exponential function?

   (1) $y = 3x - 7$ (3) $y = 3(7)^x$

   (2) $y = 7x^3$ (4) $y = 3x^2 + 7$ _____

2. If $f(x) = 6(9)^x$ then $f\left(\frac{1}{2}\right) = ?$ (Remember what we just learned about fractional exponents and do without a calculator.)

   (1) $\frac{7}{2}$ (3) 27

   (2) 18 (4) $\frac{15}{2}$ _____

3. If $h(x) = 3^x$ and $g(x) = 5x - 7$ then $h(g(2)) =$

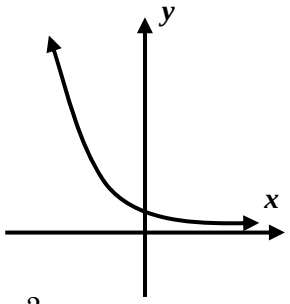
   (1) 18 (3) 38

   (2) 12 (4) 27 _____

4. Which of the following equations could describe the graph shown below?

   (1) $y = x^2 + 1$ (3) $y = -2x + 1$

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



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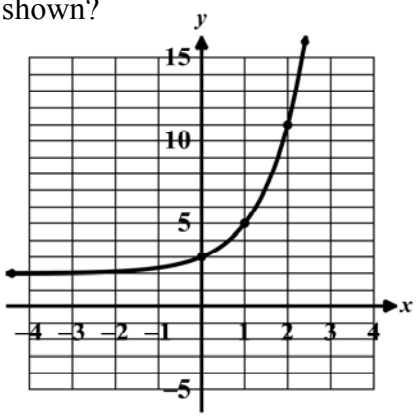
5. Which of the following equations represents the graph shown?

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

   (2) $y = 4^x + 1$ (4) $y = 3^x + 2$



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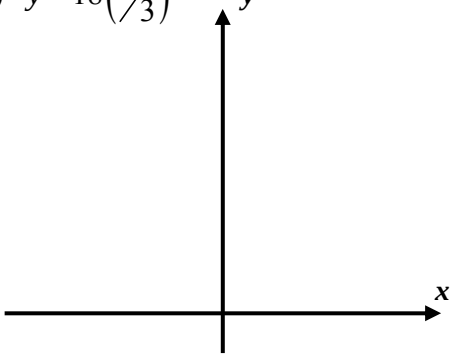
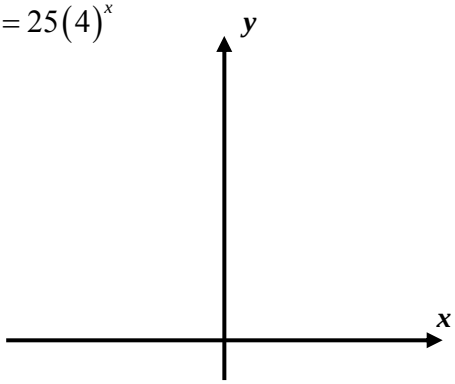
6. Sketch graphs of the equations shown below on the axes given. Label the *y*-intercepts of each graph.

(a) $y = 18\left(\frac{1}{3}\right)^x$



(b) $y = 25(4)^x$



APPLICATION

7. The Fahrenheit temperature of a cup of coffee, *F*, starts at a temperature of 185°F. It cools down according to the exponential function $F(m) = 113\left(\frac{1}{2}\right)^{m/20} + 72$, where *m* is the number minutes it has been cooling.

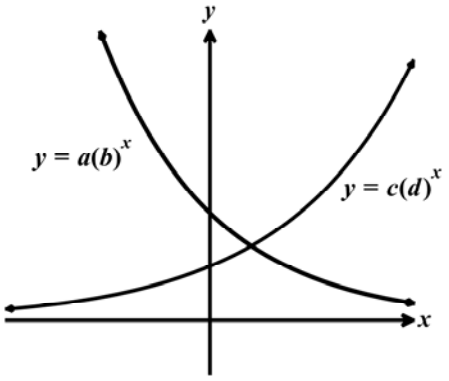
(a) How do you interpret the statement that $F(60) = 86$?

(b) Determine the temperature of the coffee after one day using your calculator. What do you think this temperature represents about the physical situation?

REASONING

8. The graph below shows two exponential functions, with real number constants *a*, *b*, *c*, and *d*. Given the graphs, only one pair of the constants shown below could be equal in value. Determine which pair could be equal and explain your reasoning.

b and *d* *a* and *b* *a* and *c*



9. Explain why the equation below can have no real solutions. If you need to, graph both sides of the equation using your calculator to visualize the reason.

$$3^x + 5 = 2$$