Notes 7.2 Exploring Equations and Graphs of Exponential Functions

In the envelope in front of you, there are twelve exponential functions. Both equation and graph are provided. Spread the twelve graphs out and divide them into two groups, not necessarily an equal amount in each group. In the space below, record which functions you put into each group and what they had in common BASED ON THE EQUATION of the function.

Now, do a different grouping of the twelve functions into two groups but this time, the grouping should be BASED ON THE GRAPH of the function.

All exponential functions have equations of the form $f(x) = a \cdot b^{c(x-h)} + k$, where the value of $b > 0$ but $b \neq 1$. For each of the following exponential functions, identify the indicated values and information to complete the table below.

Equation	**Value of *a*** How does it effect the graph?	**Value of *b***	**Value of *c*** How does it effect the graph?	**Value of *h*** How does it effect the graph?	**Value of *k*** How does it effect the graph?
1. $f(x) = \left(\frac{3}{2}\right)^{-x+2} - 2$ $f(x) = \left(\frac{3}{2}\right)^{-(x-2)} - 2$	$a=1$ no effect	$b=3/2$	$c=-1$ horizontal reflection	$h=2$ Translate right 2	$k=-2$ Translate down 2
2. $f(x) = -3^{x-1} + 2$ $f(x) = -(3)^{x-1} + 2$	$a=-1$ vertical reflection	$b=3$	$c=1$ no effect	$h=1$ Translate right 1	$k=2$ Translate up 2
3. $f(x) = 2\left(\frac{2}{3}\right)^{x-1} - 2$ $f(x) = 2\left(\frac{3}{2}\right)^{-(x-1)} - 2$	$a=2$ vertical Dilation by scale factor of 2	$b=3/2$	$c=1$ no effect	$h=1$ Translate right 1	$k=-2$ Translate down 2
4. $f(x) = -\left(\frac{2}{3}\right)^{-x+2} + 3$ $f(x) = -\left(\frac{3}{2}\right)^{x-2} + 3$	$a=-1$ vertical reflection	$b=3/2$	$c=1$ no effect	$h=2$ Translate right 2	$k=3$ Translate up 3
5. $f(x) = -3\left(\frac{1}{2}\right)^{x+1} - 1$ $f(x) = -3(2)^{-(x+1)} - 1$	$a=-3$ vertical reflection. vertical dilation by scale factor of 3.	$b=2$	$c=-1$ horizontal reflection	$h=-1$ Translate left 1	$k=-1$ Translate down 1

In the boxes below, identify how the values of a and k in the equation of $f(x) = a \cdot b^{c(x-h)} + k$ seem to affect the graph of the function.

The value of *a*	1. If $a > 0$, then the graph is above the horizontal asymptote.
	2. If $a < 0$, then the graph is below the horizontal asymptote.
The value of k	1. The value of K is the value of the horizontal asympote
	2. If $K > 0$, then the horizontal asymptote is above the x-axis.
	3. If $K < 0$, then the horizontal asymptote is below the x-axis.

In groups, match each equation below with the graphs on the next page. Write the equation and letter on the line above each graph. Discuss what the graphs and equations have in common.

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

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

c. $f(x) = -(2)^{x} + 1$

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

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

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

g. $f(x) = 2^{-x} + 1$

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

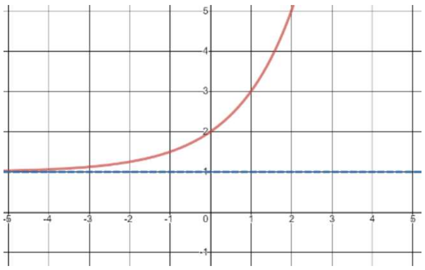
i. $f(x) = 2^{x} + 1$

j. $f(x) = -(2)^{-x} + 1$

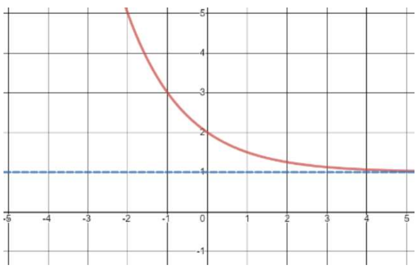
k. $f(x) = -\left(\frac{3}{2}\right)^{x} - 2$

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

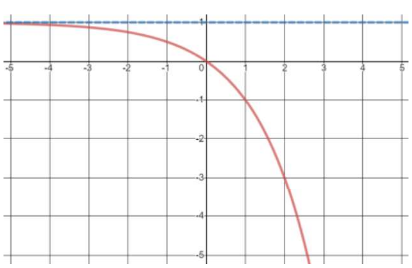
1. $f(x) = (2)^{x} + 1$



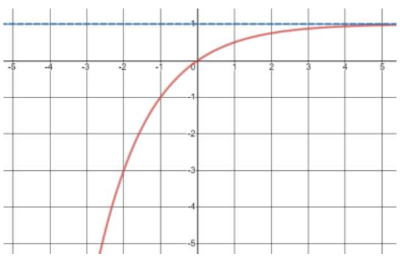
2. $f(x) = (2)^{-x} + 1$



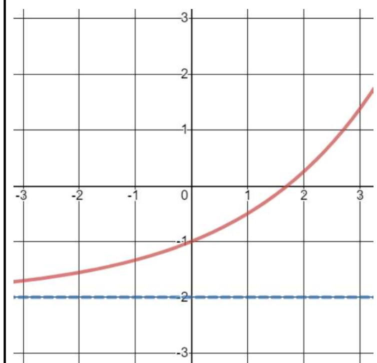
3. $f(x) = -(2)^{x} + 1$



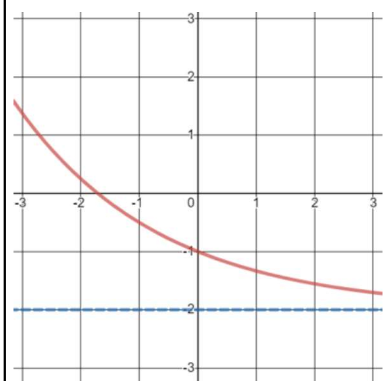
4. $f(x) = -(2)^{-x} + 1$



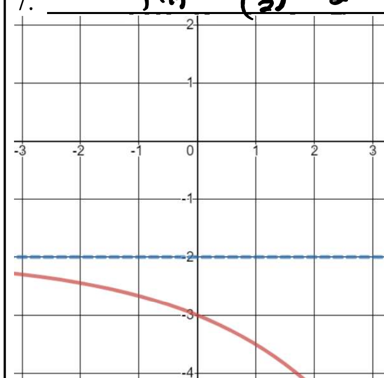
5. $f(x) = \left(\frac{3}{2}\right)^{x} - 2$



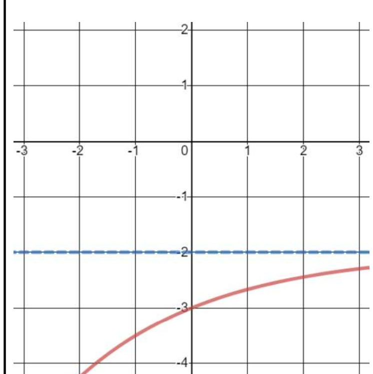
6. $f(x) = \left(\frac{3}{2}\right)^{-x} - 2$



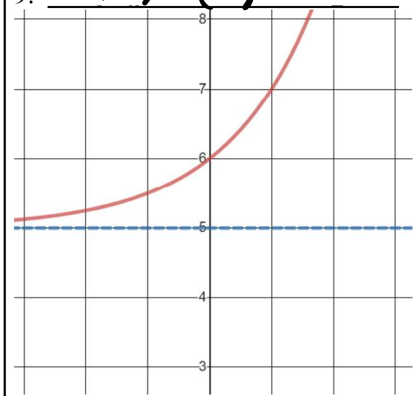
7. $f(x) = -\left(\frac{3}{2}\right)^{x} - 2$



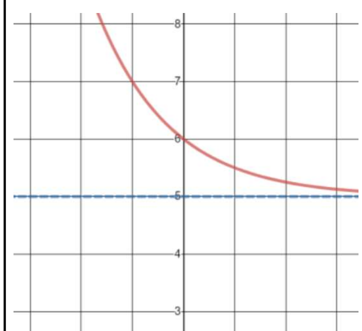
8. $f(x) = -\left(\frac{3}{2}\right)^{-x} - 2$



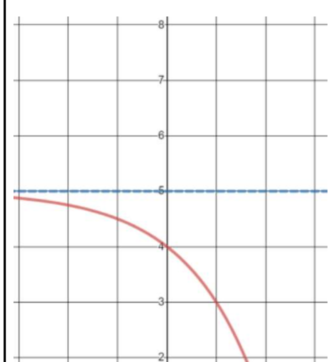
9. $f(x) = (2)^{x} + 5$



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



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



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