

SM3-A Lesson 1-8 Graph the Exponential Function  $f(x) = 2^x$

4 items needed to convert the graph into an equation.

- 1) Recognize that the graph is the exponential function.

$$g(x) = ab^x + k$$

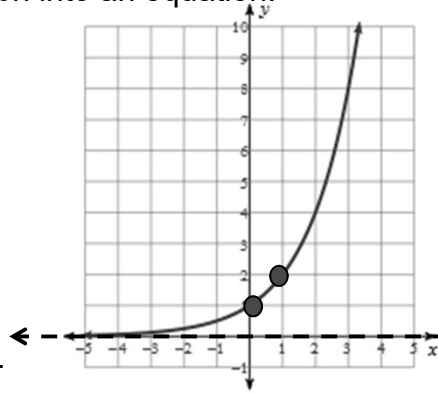
- 2) Recognize the y-value of the horizontal asymptote.

$$y = 0$$

- 3) The x-y values of the y-intercept.

$$(0, 1)$$

- 4) Find one other "lattice point" (where the graph has integer values for 'x' and 'y').  $(1, 2)$



What is the equation of the graph?

- 1) Start with the general transformation equation.

$$g(x) = ab^x + k$$

- 2) Find the value of 'k' (this is the horizontal asymptote).

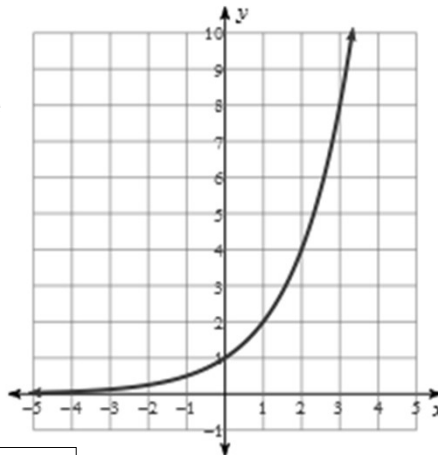
$$g(x) = ab^x + (k)$$

Horizontal asymptote:  $y = 0$

$$k = 0$$

Rewrite the equation.

$$g(x) = ab^x + k \rightarrow y = ab^x$$



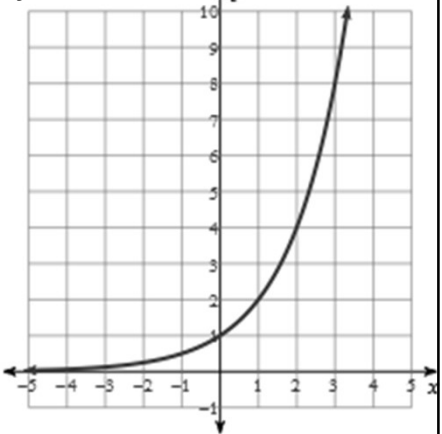
$$g(x) = ab^x + k \rightarrow y = ab^x$$

3) y-intercept  
 Substitute (0, 1) into the equation.  $y = ab^x \rightarrow 1 = ab^0$   
 Solve for 'a'      $a = 1$

Rewrite the equation  
 $y = ab^x \rightarrow y = b^x$

4) Substitute a "nice" x-y pair from the graph into the equation.  
 Substitute (1, 2) into the equation.  
 $y = b^x \rightarrow 2 = b^1$   
 Solve for 'b'      $b = 2$

Rewrite the equation  
 $y = 2^x$



What is the equation of the graph?

1) Start with  $g(x) = ab^x + k$

2) horizontal asymptote  $y = 1$   
 $k = 1$       $y = ab^x + 1$

3) y-intercept (0, 4)  $4 = ab^0 + 1$   
 $a = 3$       $y = 3b^x + 1$

4) "Nice" x-y pair (-1, 7)  
 $7 = 3b^{-1} + 1$   
 $6 = 3b^{-1}$   
 $2 = b^{-1}$       $2 = \frac{1}{b}$       $b = \frac{1}{2}$       $y = 3\left(\frac{1}{2}\right)^x + 1$

