

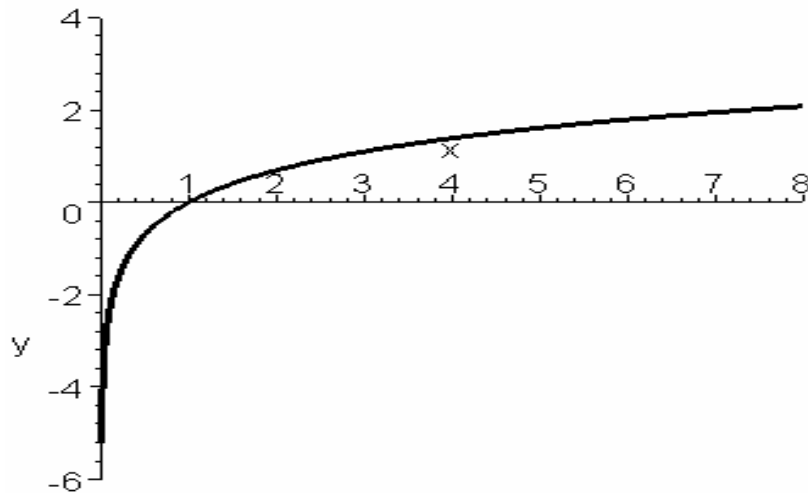
# Transformations of Functions

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**Mathematics Enrichment  
through Technology**



Since the  $\log 1 = 0$ , a good reference point when graphing  $y = \log x$  is  $(1, 0)$



Notice, when graphing  $y = \log x$ , the x-intercept is 1

Given the following function,

$$y = a + \log x$$

If:  $a > 0$ , then shift the graph “ $a$ ” units  
up, using the reference point  $(1,0)$

If:  $a < 0$ , then shift the graph “ $a$ ” units down,  
using the reference point  $(1,0)$

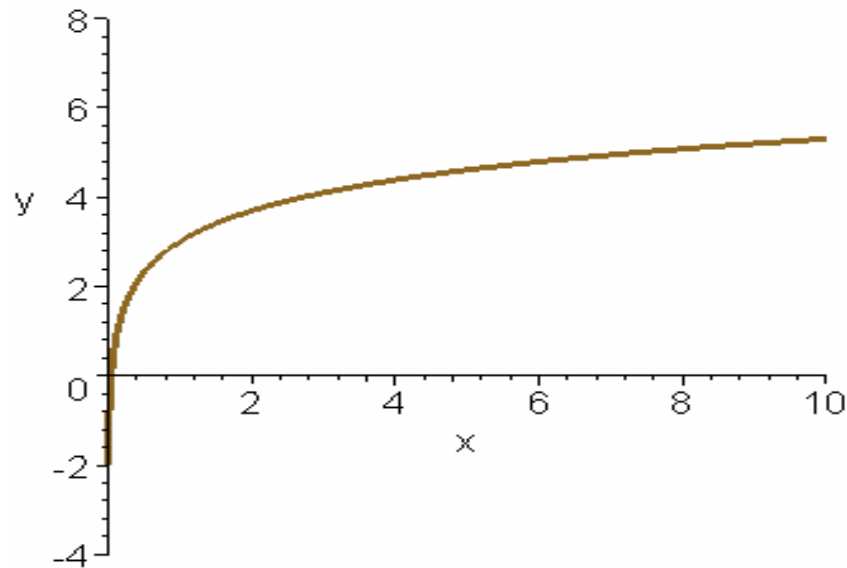
Given the following function,

$$y = 3 + \log x$$

Since  $a > 0$ , then shift the graph “3” units up, using the reference point  $(1,0)$

# Let's Graph

$$y = 3 + \log x$$

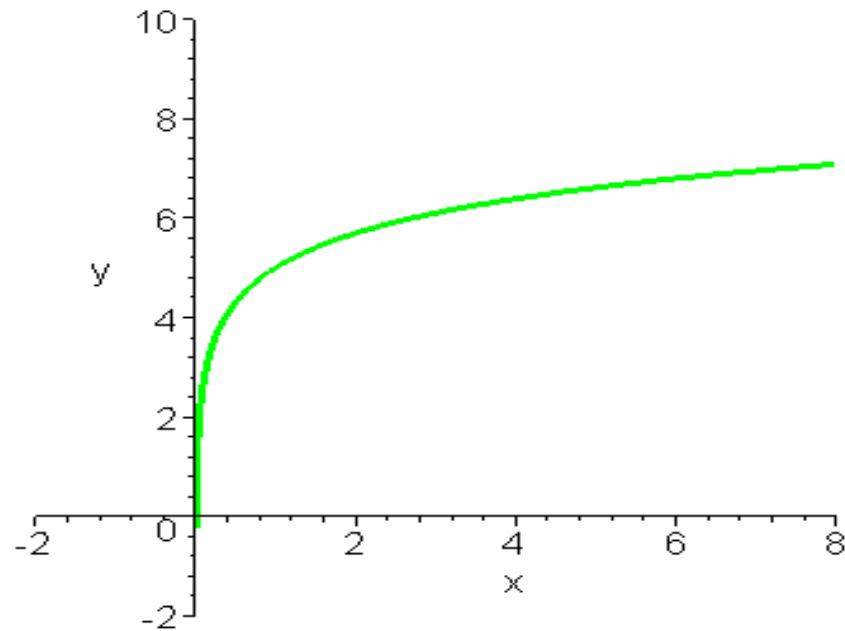


$$y = 5 + \log x$$

How will the  
graph look?

# Let's Graph

$$y = 5 + \log x$$



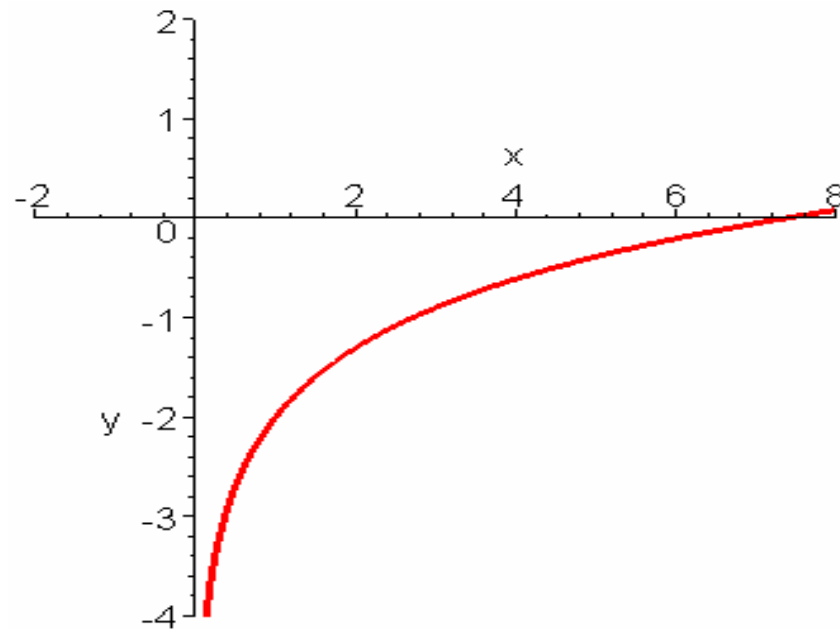
$$y = -2 + \log x$$

How will the  
graph look?



# Let's Graph

$$y = -2 + \log x$$

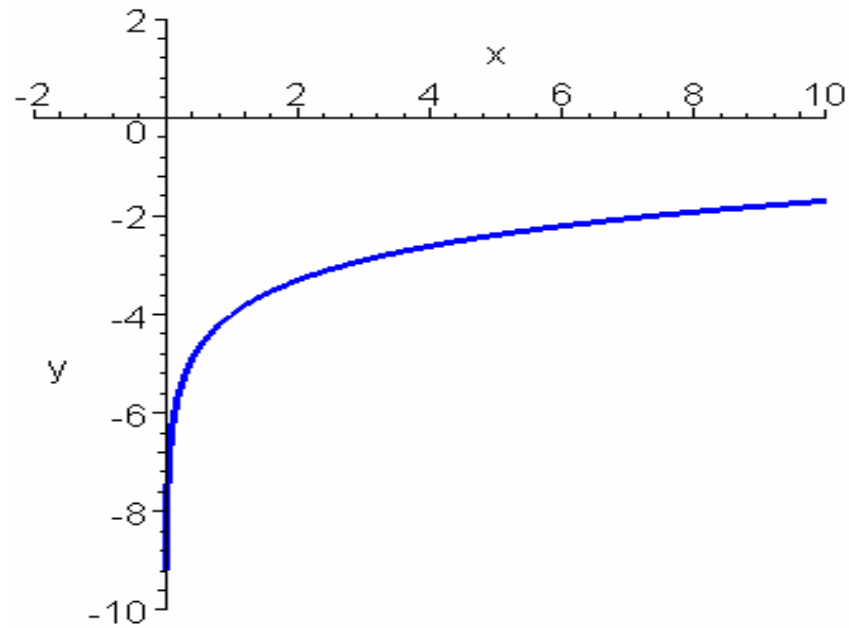


$$y = -4 + \log x$$

How will the  
graph look?

# Let's Graph

$$y = -4 + \log x$$



Given the following function,

$$y = \log(x - b)$$

We get the expression  $(x - b)$

and equal it to zero

$$x - b = 0$$

$$x = b$$

If:  $b > 0$ , then shift the graph “ $b$ ” units to the right, using the reference point  $(1,0)$

If:  $b < 0$ , then shift the graph “ $b$ ” units to the left, using the reference point  $(1,0)$

Given the following function,

$$y = \log(x - 1)$$

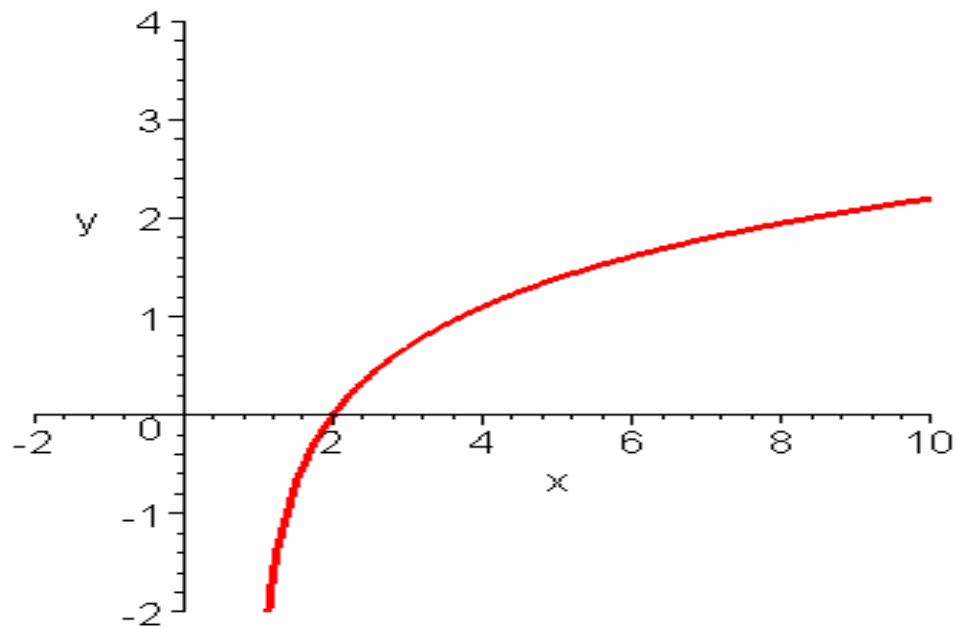
$$x - 1 = 0$$

$$x = 1$$

Since  $1 > 0$ , then shift the graph “1” unit right, using the reference point  $(1, 0)$

# Let's Graph

$$y = \log(x - 1)$$

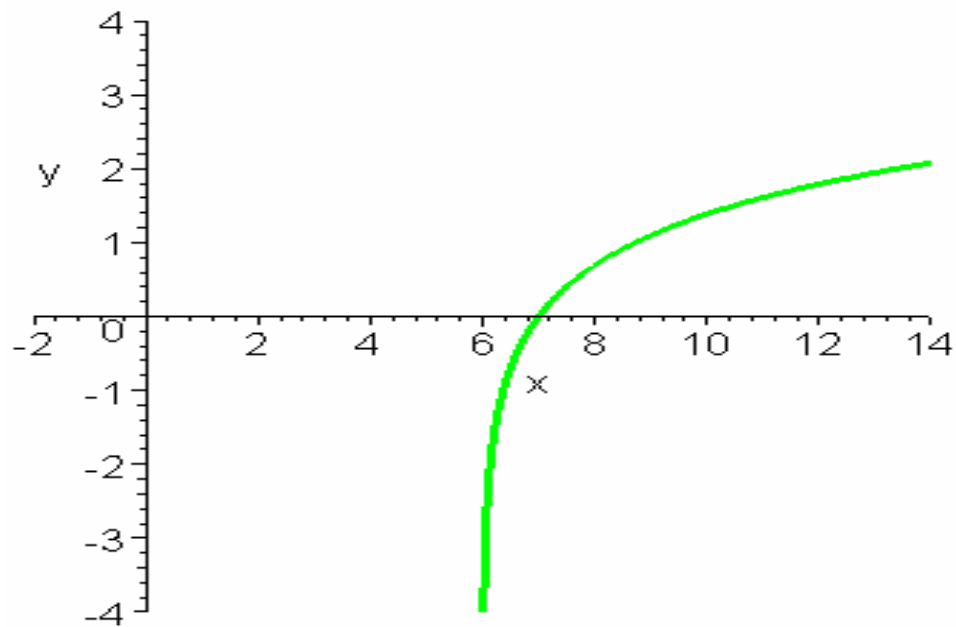


$$y = \log(x - 6)$$

How will the  
graph look?

# Let's Graph

$$y = \log(x - 6)$$



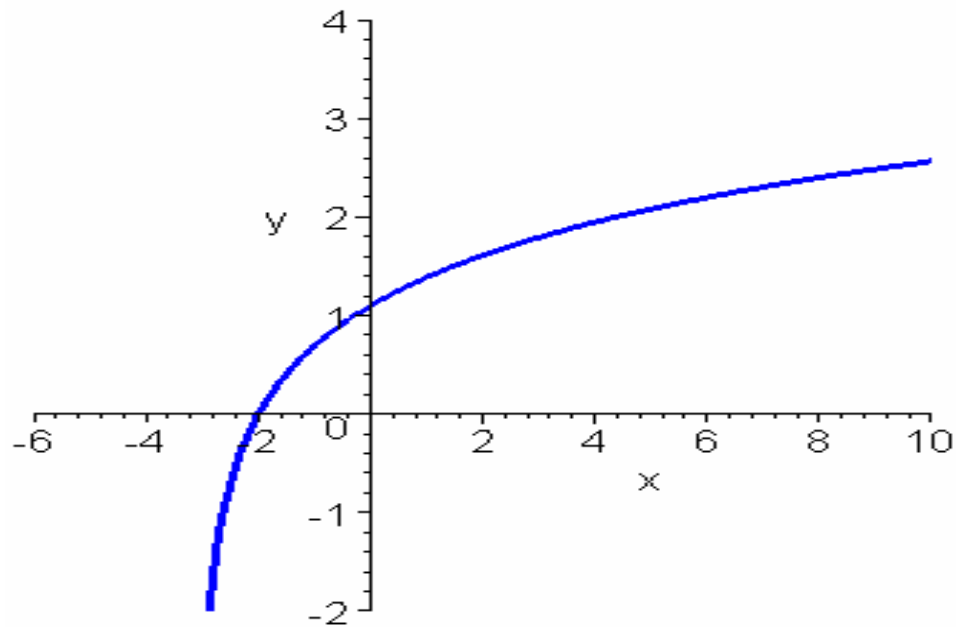


$$y = \log(x + 3)$$

How will the  
graph look?

# Let's Graph

$$y = \log(x + 3)$$

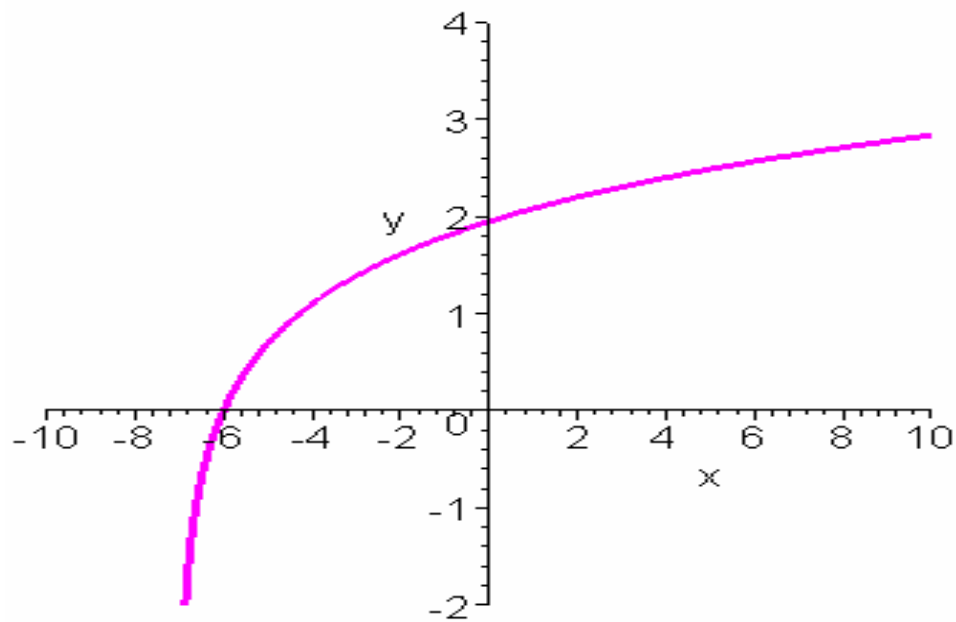


$$y = \log(x + 7)$$

How will the  
graph look?

# Let's Graph

$$y = \log(x + 7)$$



# Graphing

$$y = 3 + \log(x + 1)$$

Recall: Shift "3" units up since  $3 > 0$   
then we use the expression  $x + 1$ ,  
and equal it to zero

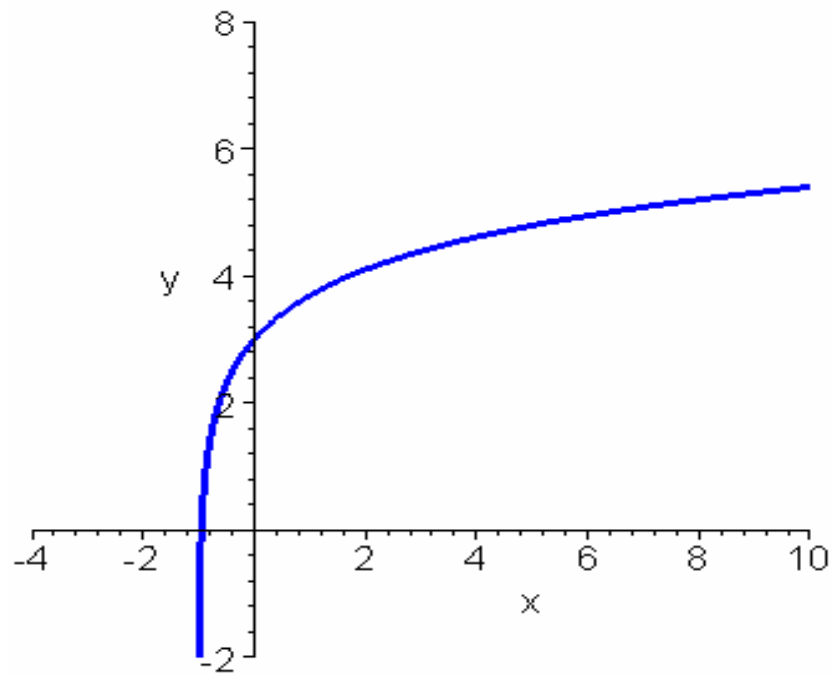
$$x + 1 = 0$$

$$x = -1$$

Since  $-1 < 0$ , then we shift  
"1" unit to the left

# Let's Graph

$$y = 3 + \log(x + 1)$$

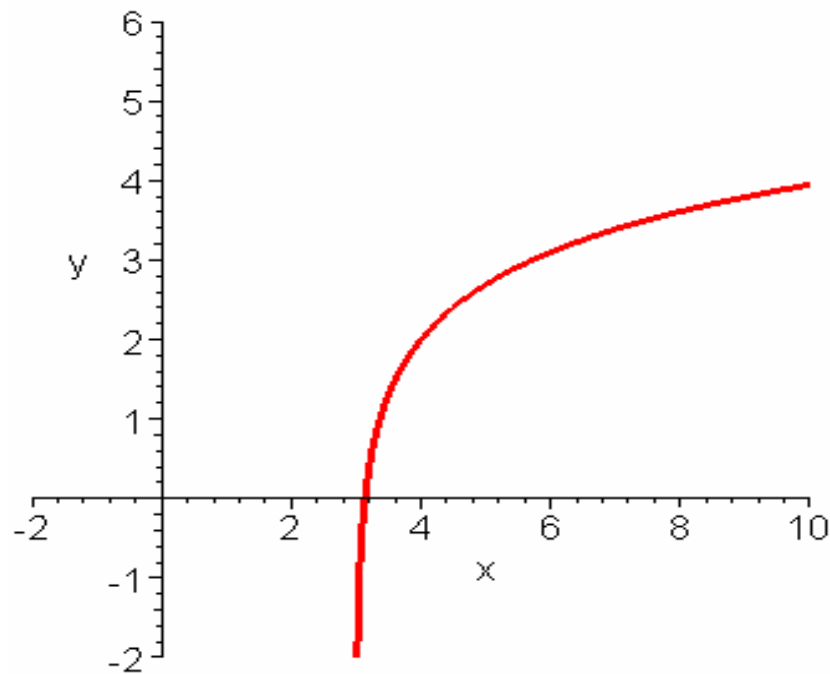


$$y = 2 + \log(x - 3)$$

How will the  
graph look?

# Let's Graph

$$y = 2 + \log(x - 3)$$



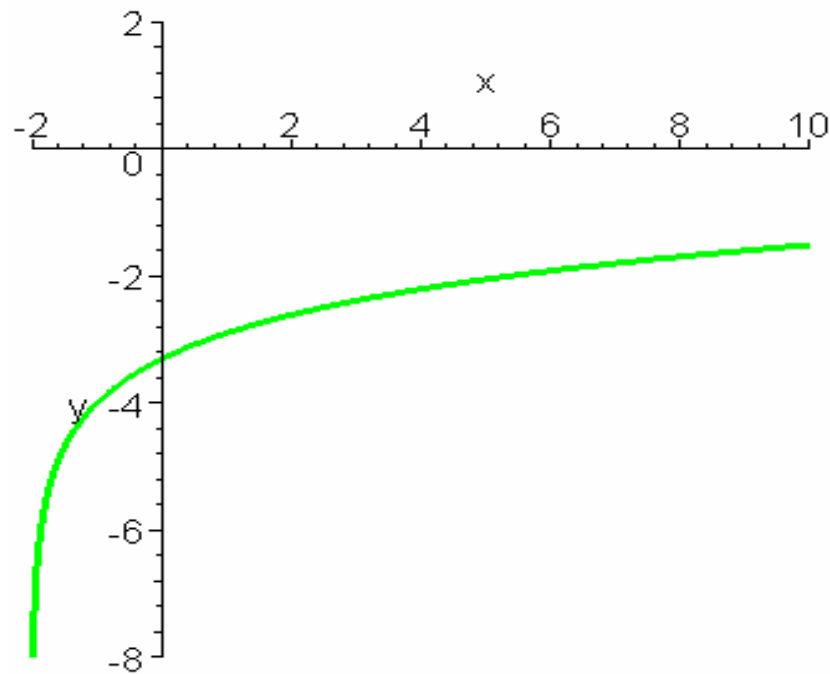


$$y = -4 + \log(x + 2)$$

How will the  
graph look?

# Let's Graph

$$y = -4 + \log(x + 2)$$

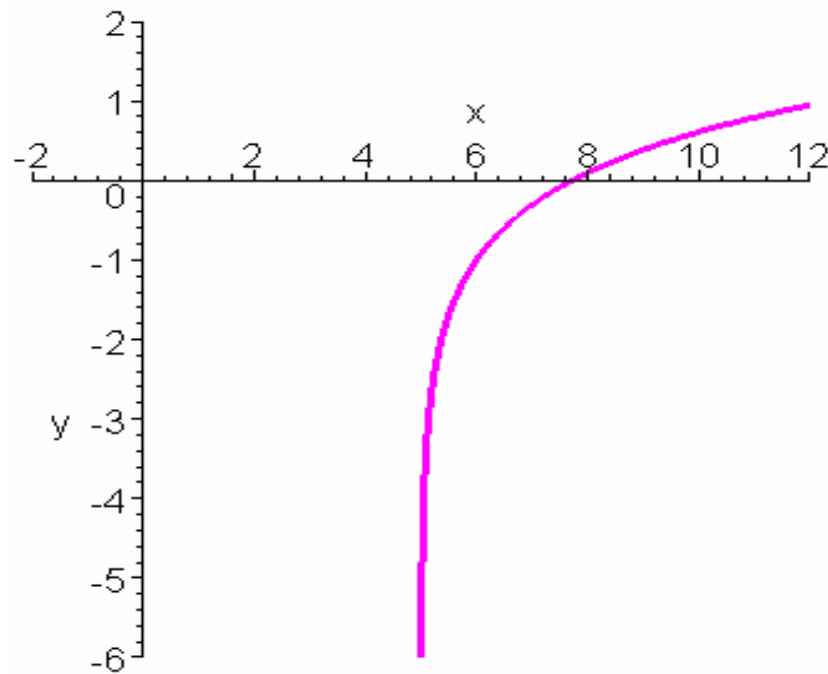


$$y = -1 + \log(x - 5)$$

How will the  
graph look?

# Let's Graph

$$y = -1 + \log(x - 5)$$



Given the following function,

$$y = c \log x$$

For this equation,  $c$  determines  
how wide or thin it will be.

if:  $|c| > 1$ , then the graph is closer to the y-axis

if:  $|c| = 1$ , then the graph remains the same

if:  $0 < |c| < 1$ , then the graph is further  
from the y-axis

if  $c$  is a negative number, then the graph  
will reflect on the x-axis

Given the following function,

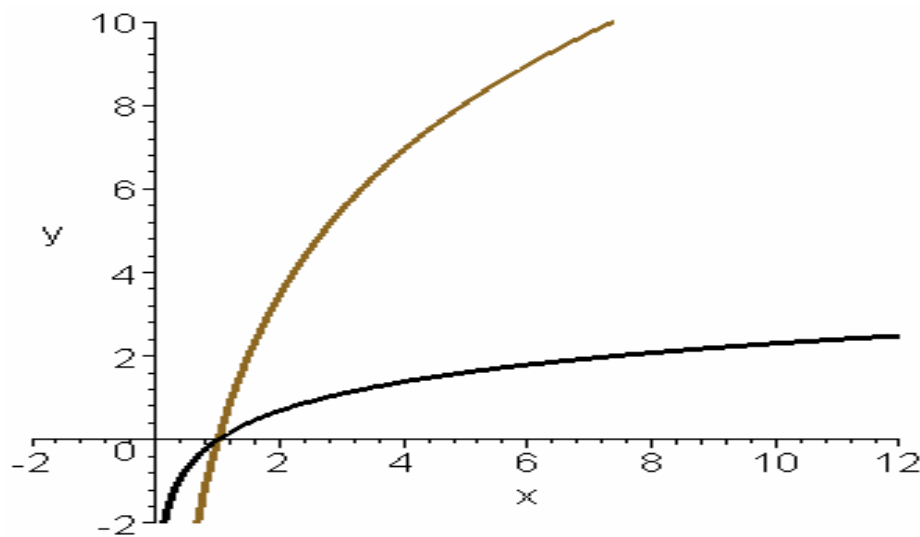
$$y = 5 \log x$$

Since  $|5| > 0$ , then the graph is closer to the y-axis

# Let's Graph

$$y = \log x$$

$$y = 5 \log x$$



$$y = 4 \log x$$

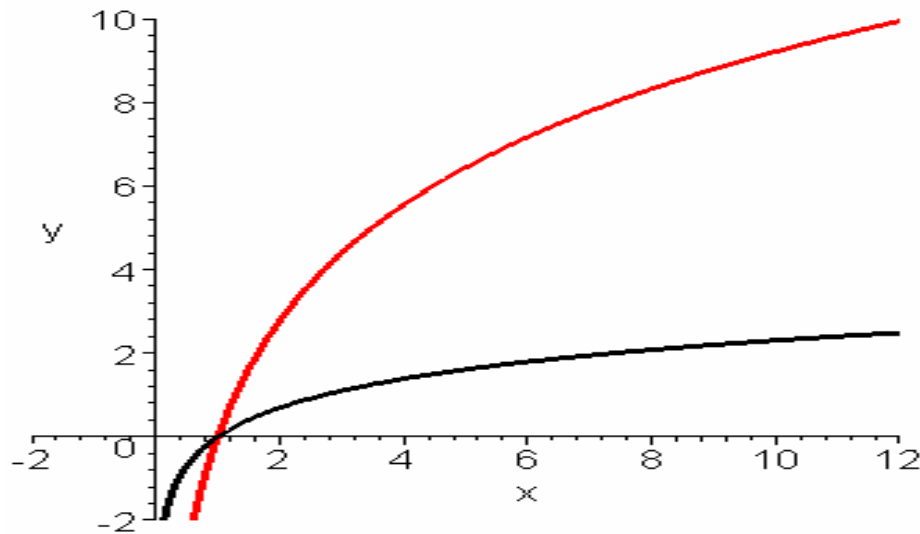
How will the  
graph look?



# Let's Graph

$$y = \log x$$

$$y = 4 \log x$$



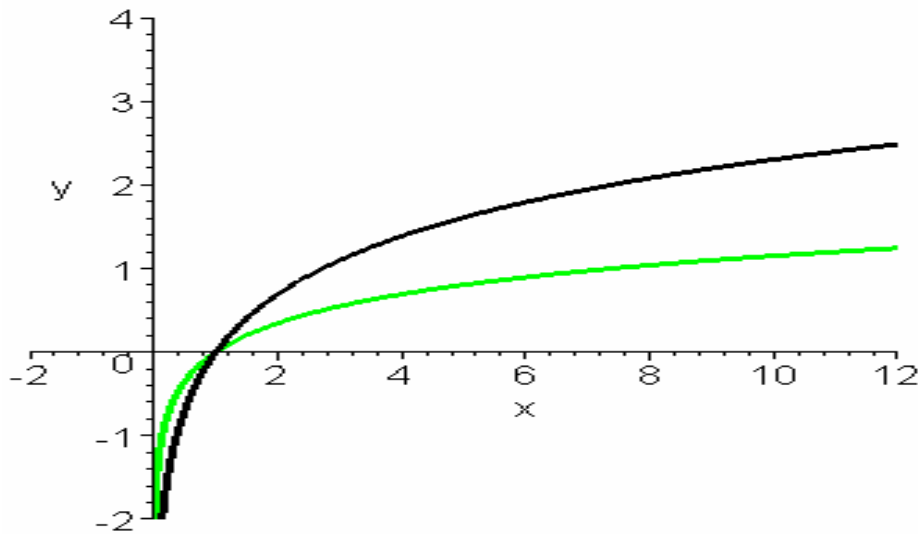
$$y = \frac{1}{2} \log x$$

How will the  
graph look?

# Let's Graph

$$y = \log x$$

$$y = \frac{1}{2} \log x$$



$$y = -\frac{2}{3} \log x$$

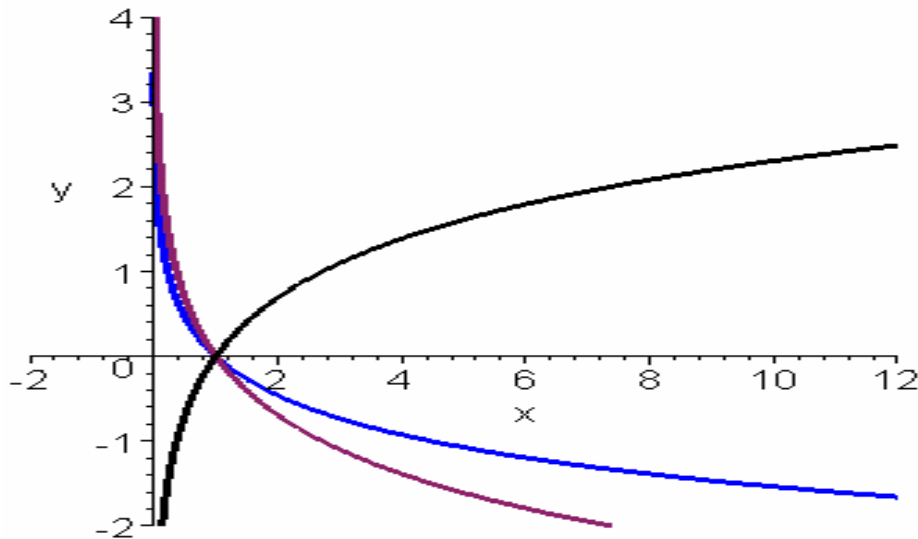
How will the  
graph look?

# Let's Graph

$$y = \log x$$

$$y = -\log x$$

$$y = -\frac{2}{3}\log x$$



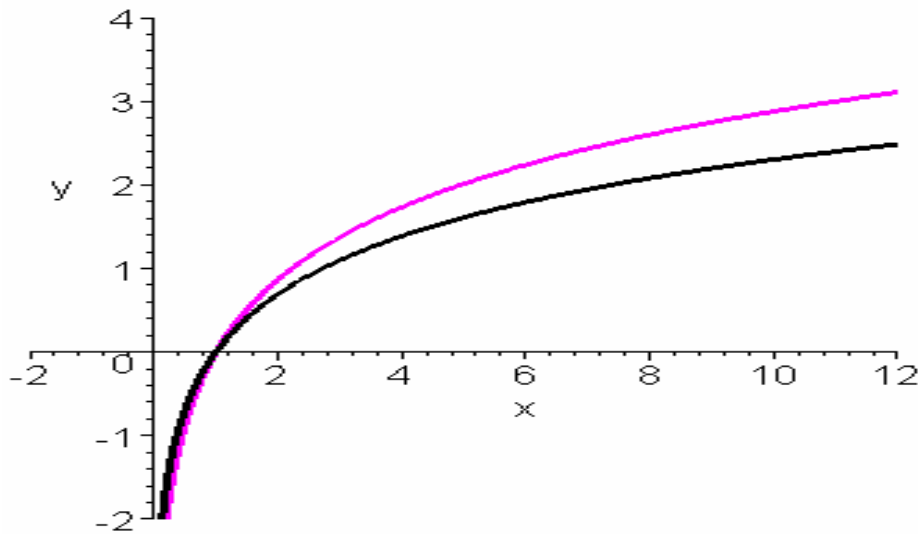
$$y = \frac{5}{4} \log x$$

How will the  
graph look?

# Let's Graph

$$y = \log x$$

$$y = \frac{5}{4} \log x$$



Given the following function,

$$y = 4 + 5 \log(x - 1)$$

Since  $4 > 0$ , shift the graph “4” units up, using the reference point  $(1,0)$

$$x - 1 = 0$$

$$x = 1$$

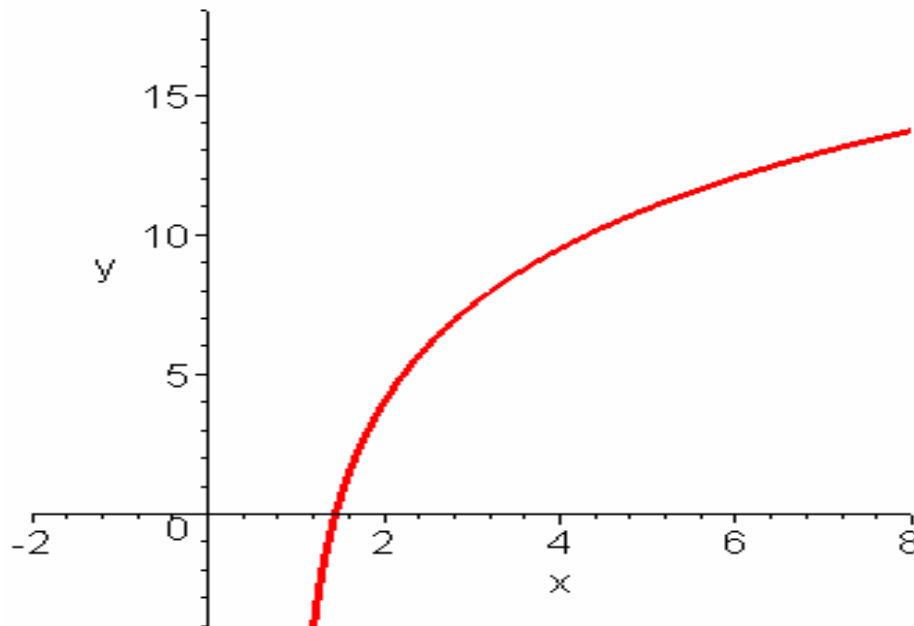
Since  $1 > 0$ , then shift the graph “1” unit to the right, using the reference point  $(1,0)$ .

Since  $|5| > 0$  shift the graph closer to the y-axis.



# Let's Graph

$$y = 4 + 5\log(x - 1)$$

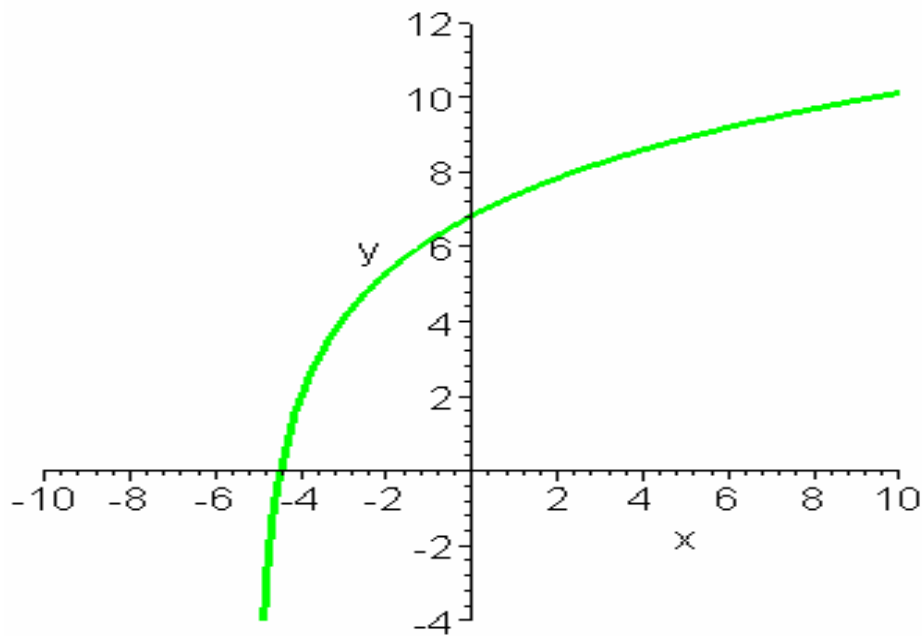


$$y = 2 + 3\log(x + 5)$$

How will the  
graph look?

# Let's Graph

$$y = 2 + 3\log(x + 5)$$

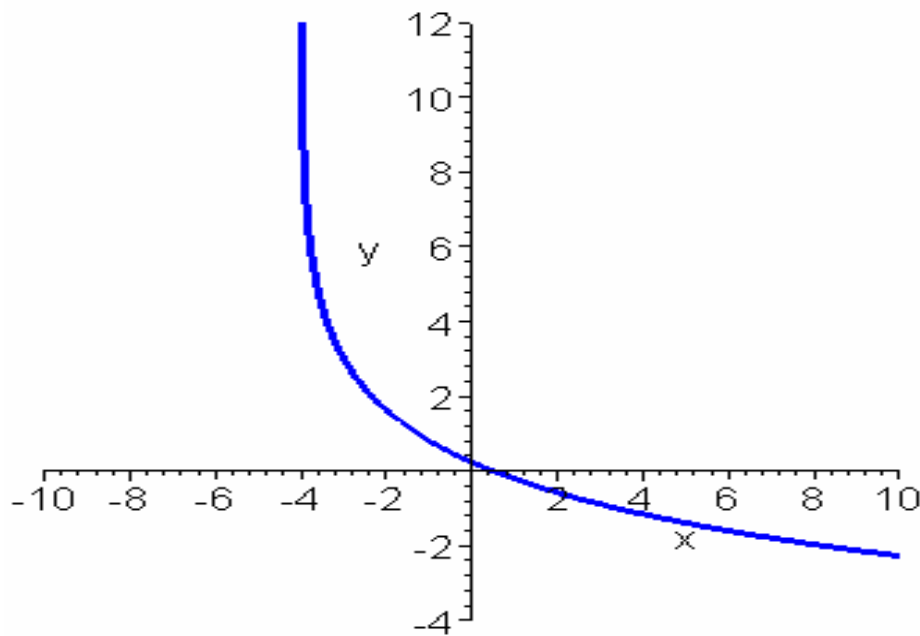


$$y = 3 - 2\log(x + 4)$$

How will the  
graph look?

# Let's Graph

$$y = 3 - 2\log(x + 4)$$

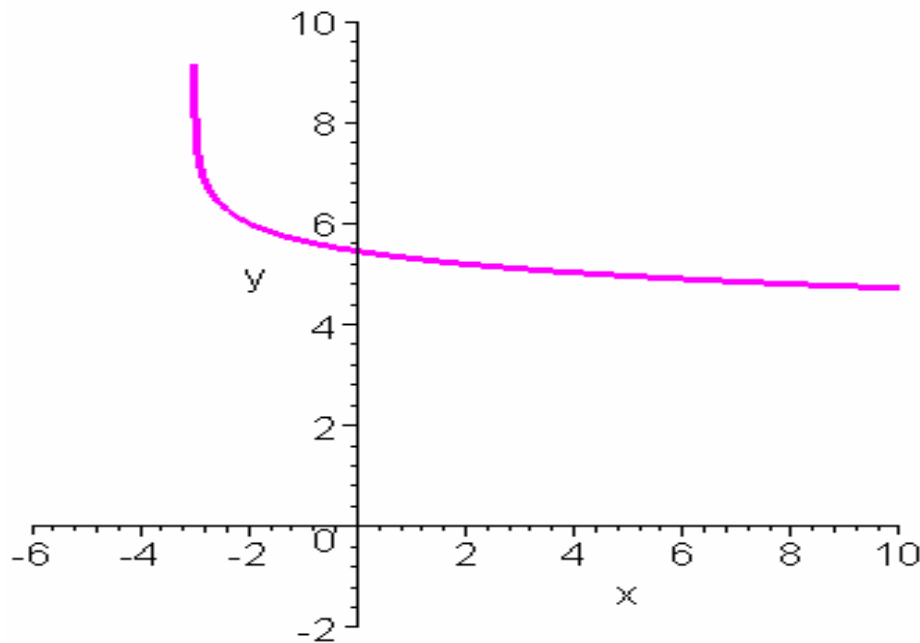


$$y = 6 - \frac{1}{2} \log(x + 3)$$

How will the  
graph look?

# Let's Graph

$$y = 6 - \frac{1}{2} \log(x + 3)$$



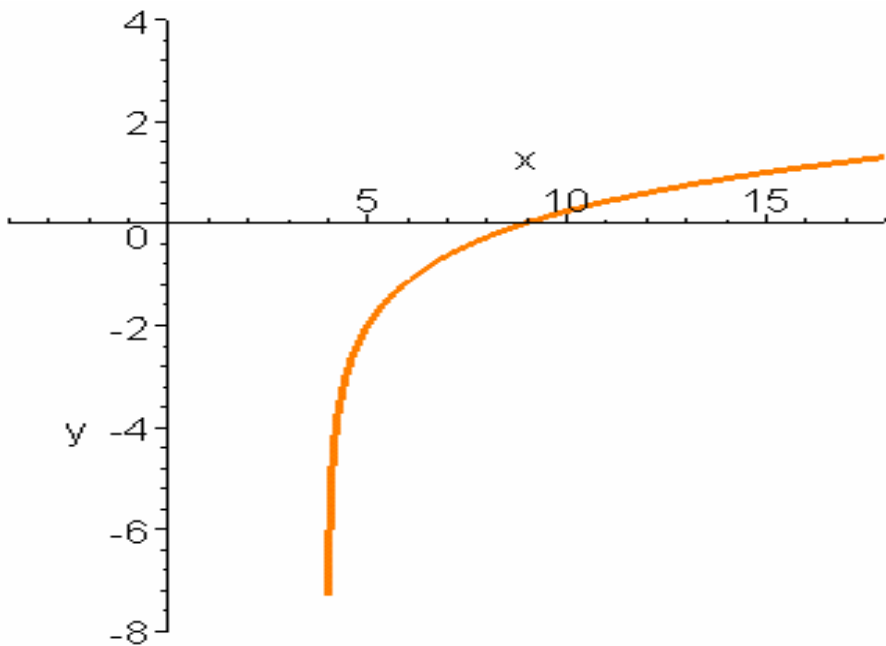
$$y = -2 + \frac{5}{4} \log(x - 4)$$

How will the  
graph look?



# Let's Graph

$$y = -2 + \frac{5}{4} \log(x - 4)$$

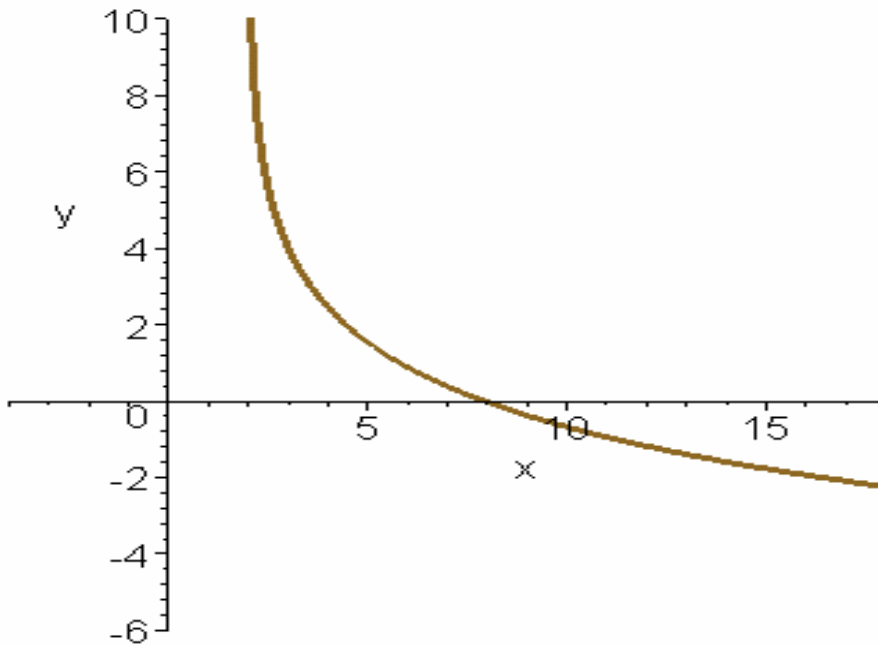


$$y = 4 - \frac{9}{4} \log(x - 2)$$

How will the  
graph look?

# Let's Graph

$$y = 4 - \frac{9}{4} \log(x - 2)$$

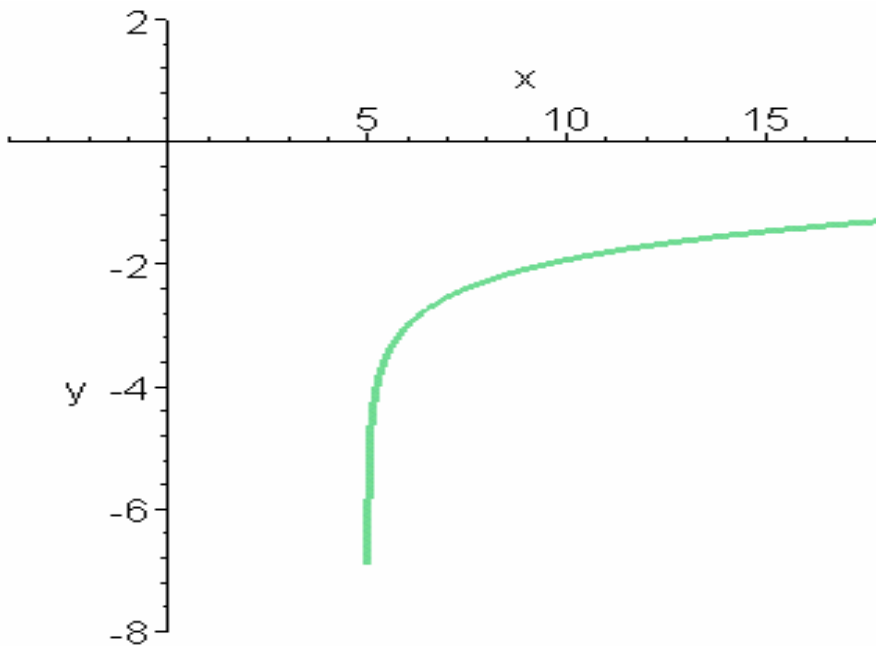


$$y = -3 + \frac{2}{3} \log(x - 5)$$

How will the  
graph look?

# Let's Graph

$$y = -3 + \frac{2}{3} \log(x - 5)$$

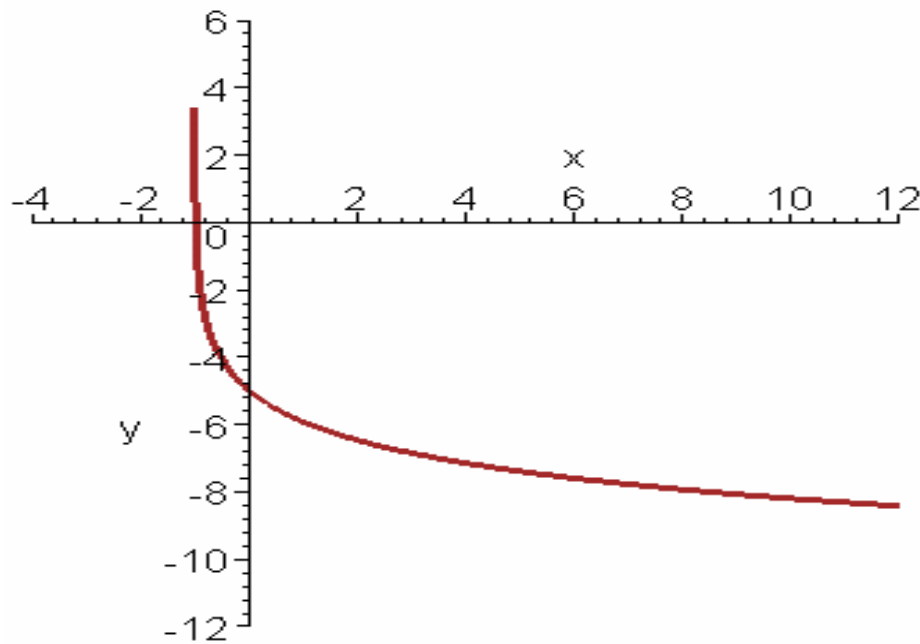


$$y = -5 - \frac{4}{3} \log(x + 1)$$

How will the  
graph look?

# Let's Graph

$$y = -5 - \frac{4}{3} \log(x+1)$$



# Congratulations!!

You just completed the  
transformation of

$$y = \log(x)$$