

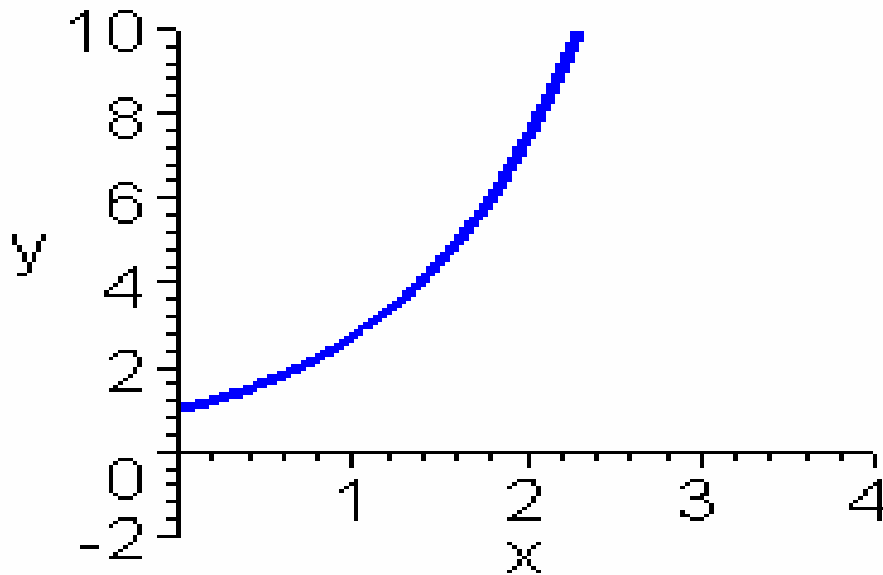
# Transformations of Functions

**Viviana C. Castellón**  
**East Los Angeles College**  
**MEnTe**

**Mathematics Enrichment  
through Technology**



A good reference point  
when graphing  
 $y = e^x$  is  $(0,1)$



Given the following function,

$$y = a + e^x$$

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

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

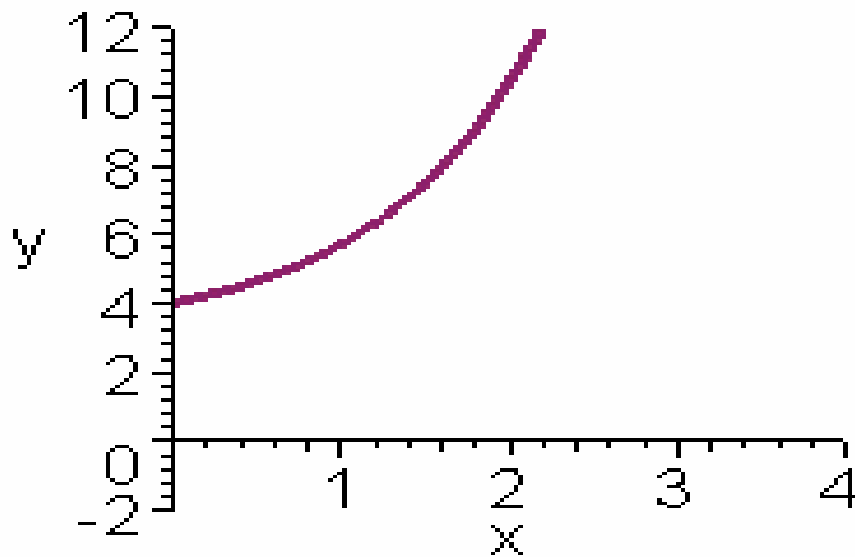
Given the following function,

$$y = 3 + e^x$$

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

# Let's Graph

$$y = 3 + e^x$$

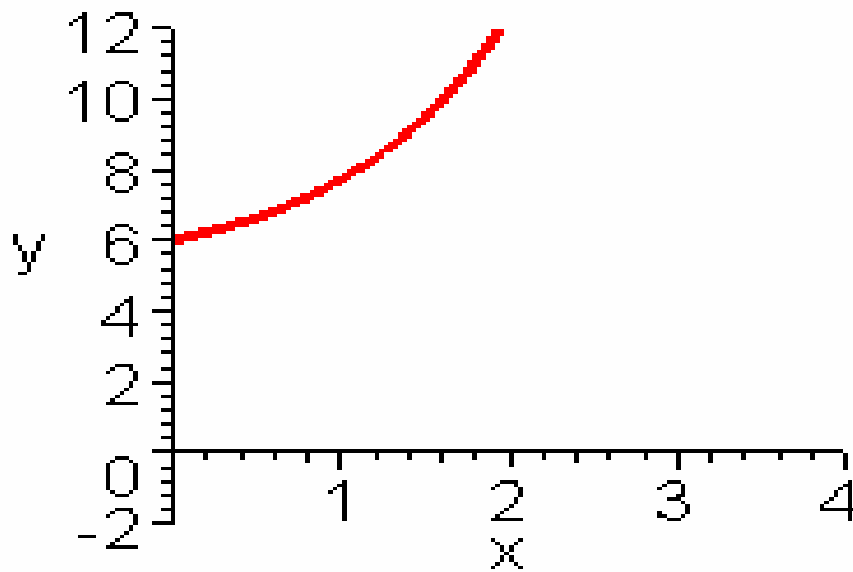


$$y = 5 + e^x$$

How will the  
graph look?

# Let's Graph

$$y = 5 + e^x$$

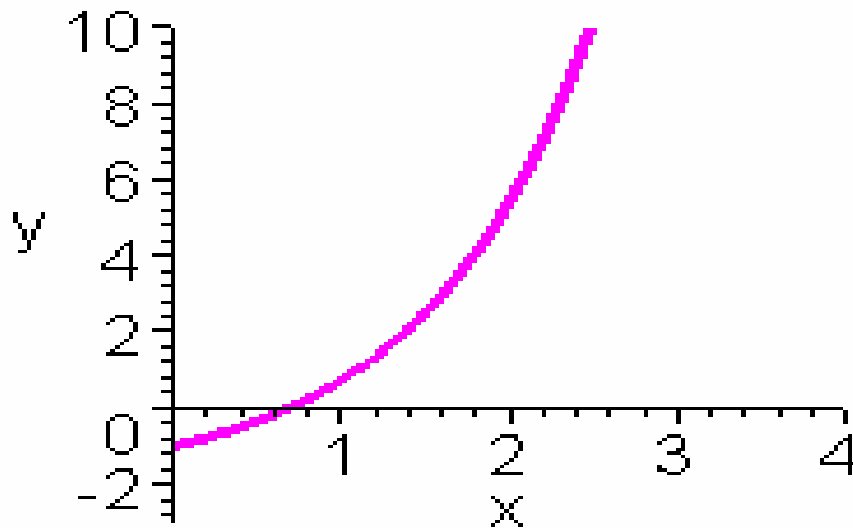


$$y = -2 + e^x$$

How will the  
graph look?

# Let's Graph

$$y = -2 + e^x$$

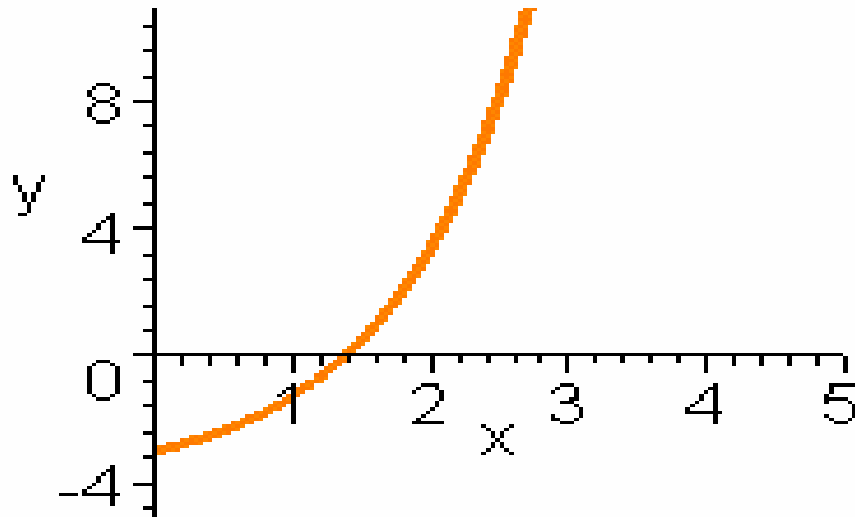


$$y = -4 + e^x$$

How will the  
graph look?

# Let's Graph

$$y = -4 + e^x$$



Given the following function,

$$y = e^{(x-b)}$$

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  $(0,1)$

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

Given the following function,

$$y = e^{(x-1)}$$

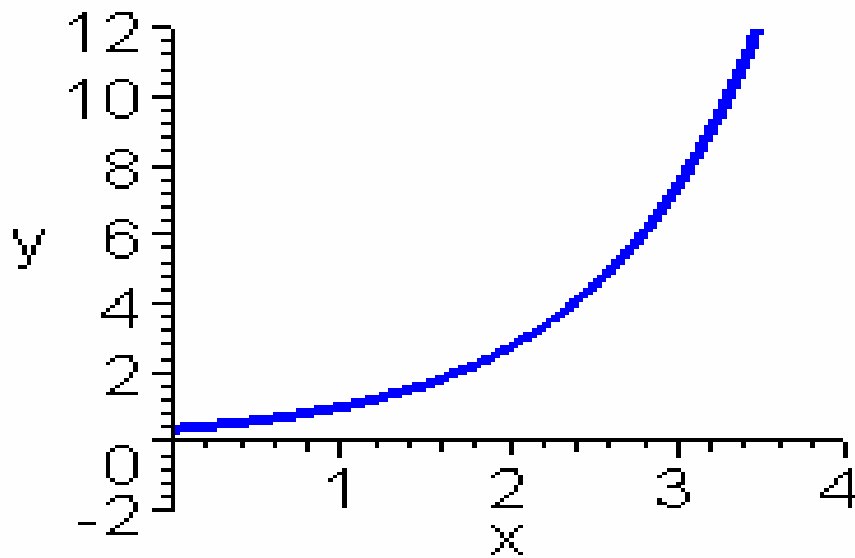
$$x - 1 = 0$$

$$x = 1$$

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

# Let's Graph

$$y = e^{x-1}$$

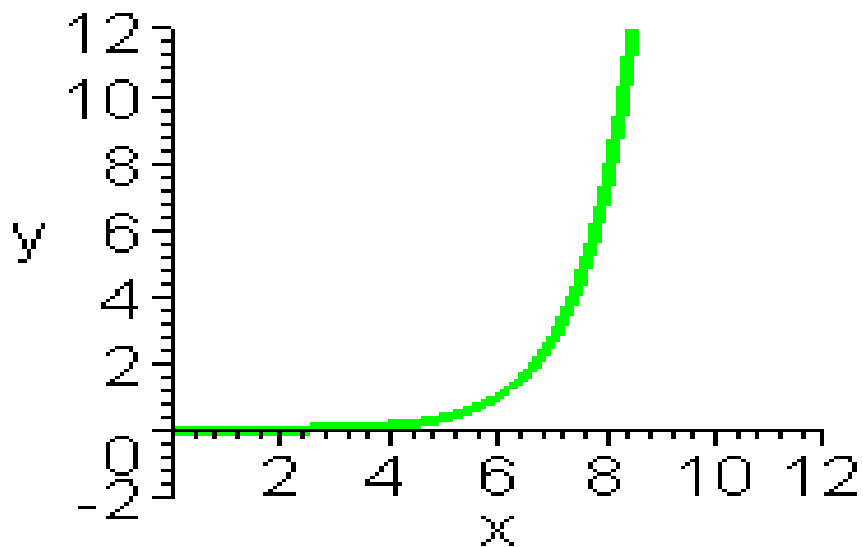


$$y = e^{x-6}$$

How will the  
graph look?

# Let's Graph

$$y = e^{x-6}$$

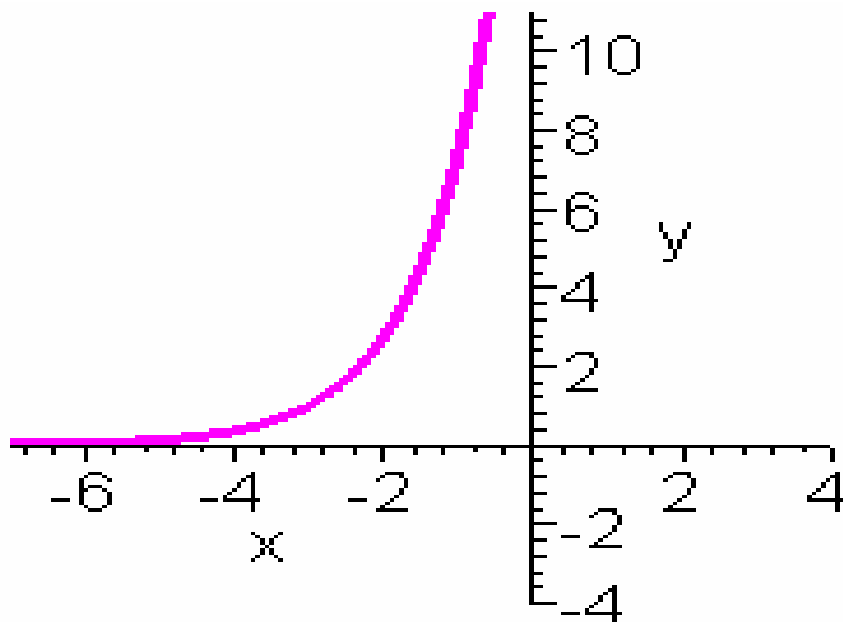


$$y = e^{x+3}$$

How will the  
graph look?

# Let's Graph

$$y = e^{x+3}$$

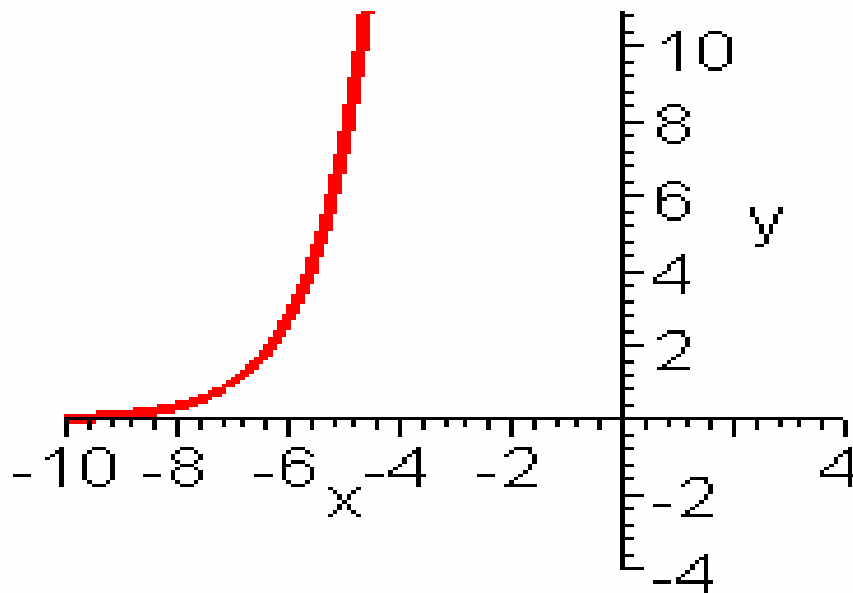


$$y = e^{x+7}$$

How will the  
graph look?

# Let's Graph

$$y = e^{x+7}$$



# Graphing

$$y = 3 + e^{(x+1)}$$

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

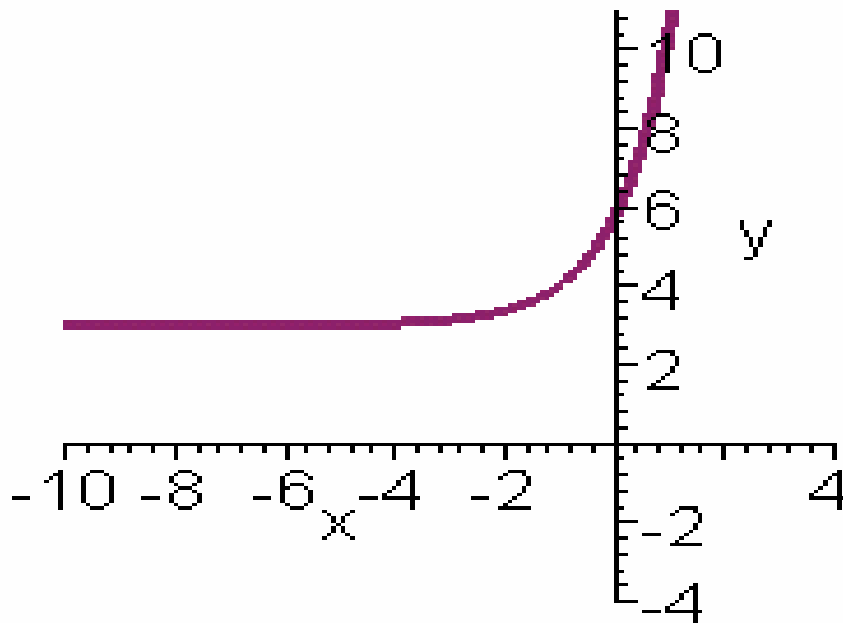
$$x + 1 = 0$$

$$x = -1$$

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

# Let's Graph

$$y = 3 + e^{x+1}$$

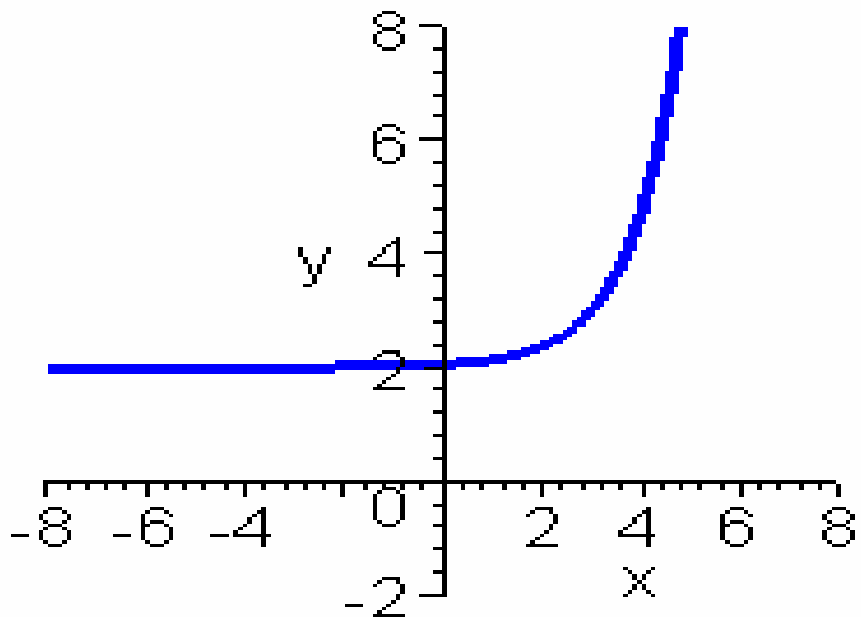


$$y = 2 + e^{x-3}$$

How will the  
graph look?

# Let's Graph

$$y = 2 + e^{x-3}$$

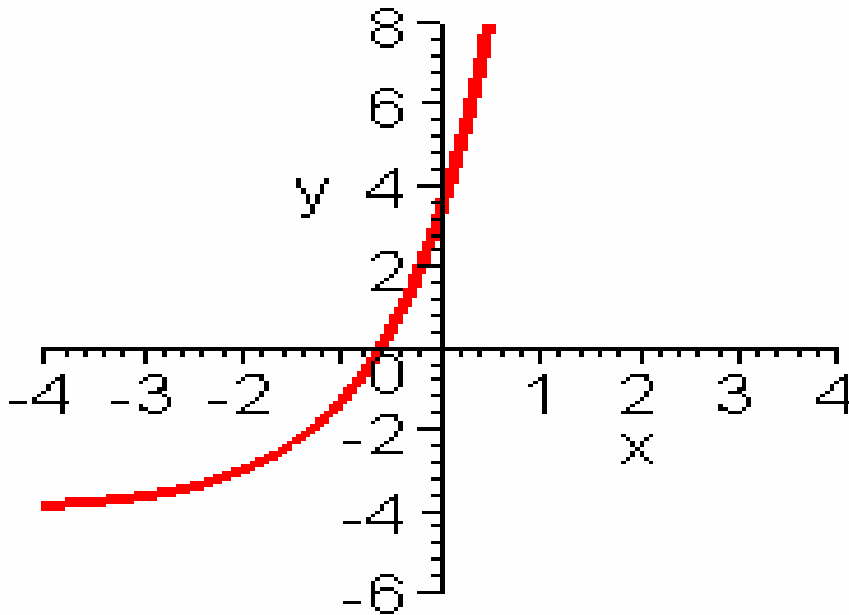


$$y = -4 + e^{x+2}$$

How will the  
graph look?

# Let's Graph

$$y = -4 + e^{x+2}$$

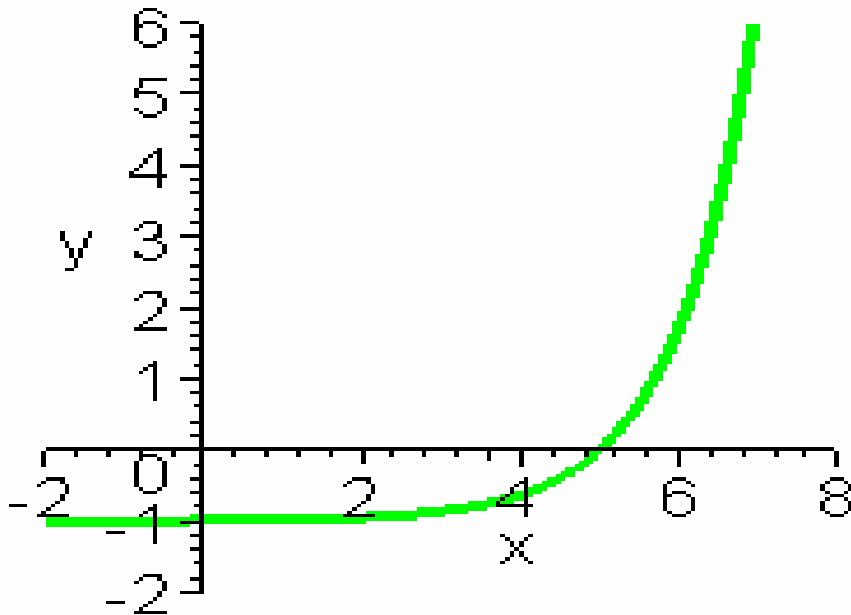


$$y = -1 + e^{x-5}$$

How will the  
graph look?

# Let's Graph

$$y = -1 + e^{x-5}$$



Given the following function,

$$y = ce^x$$

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,

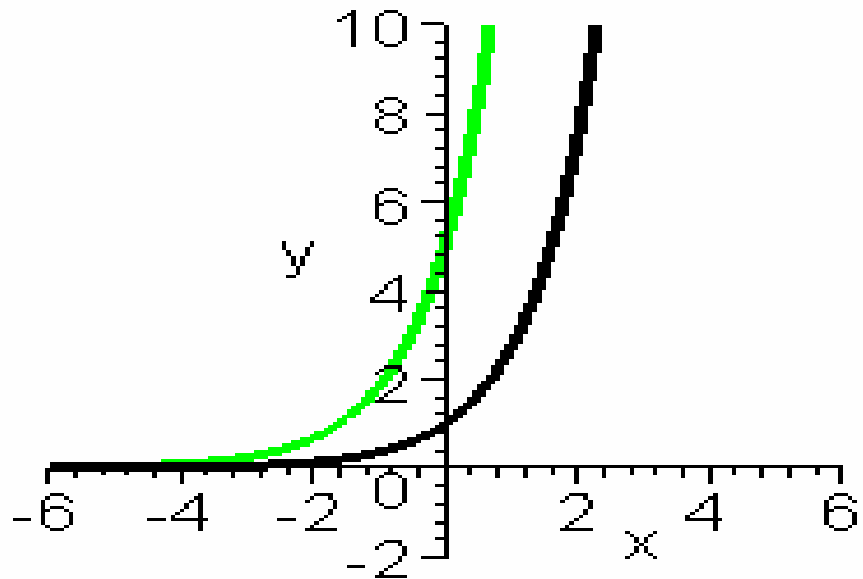
$$y = 5e^x$$

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

# Let's Graph

$$y = e^x$$

$$y = 5e^x$$



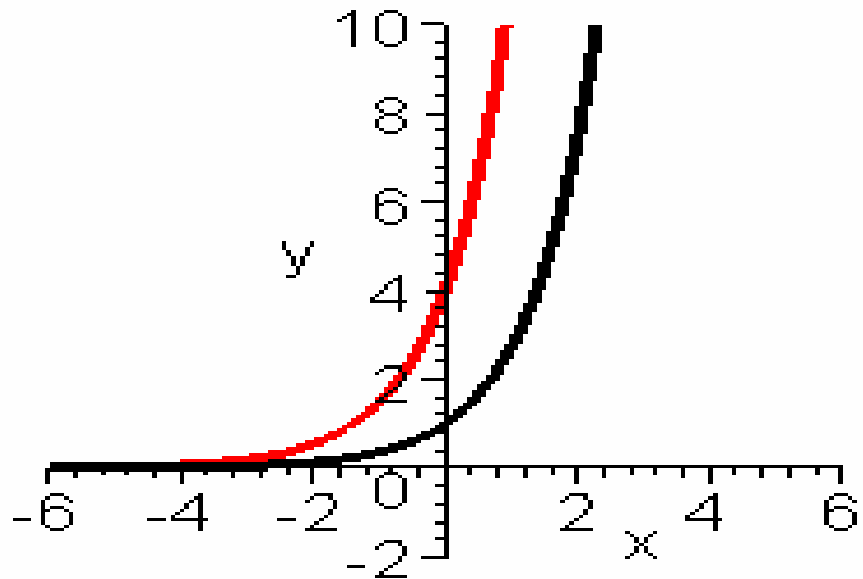
$$y = 4e^x$$

How will the  
graph look?

# Let's Graph

$$y = e^x$$

$$y = 4e^x$$



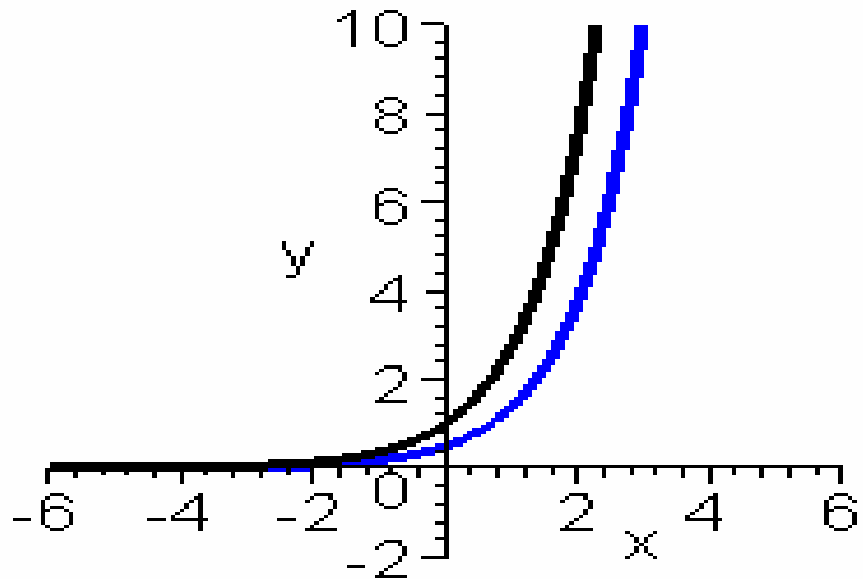
$$y = \frac{1}{2} e^x$$

How will the  
graph look?

# Let's Graph

$$y = e^x$$

$$y = \frac{1}{2}e^x$$



$$y = -\frac{2}{3}e^x$$

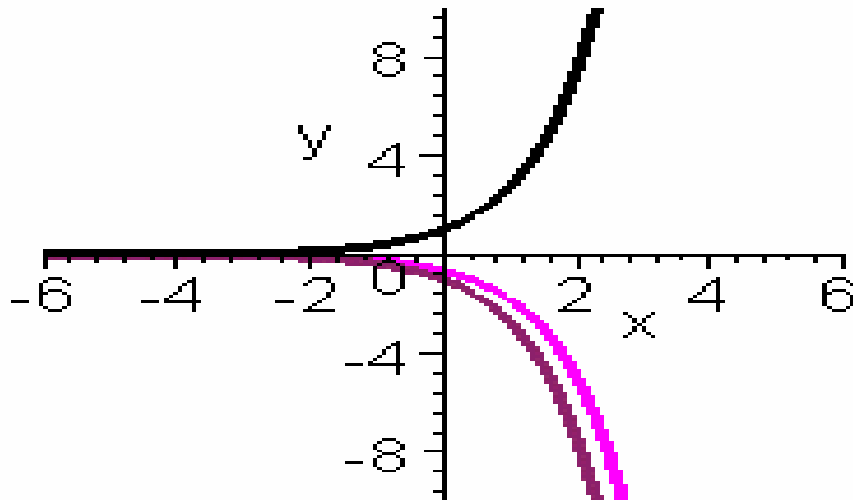
How will the  
graph look?

# Let's Graph

$$y = e^x$$

$$y = -e^x$$

$$y = -\frac{2}{3}e^x$$



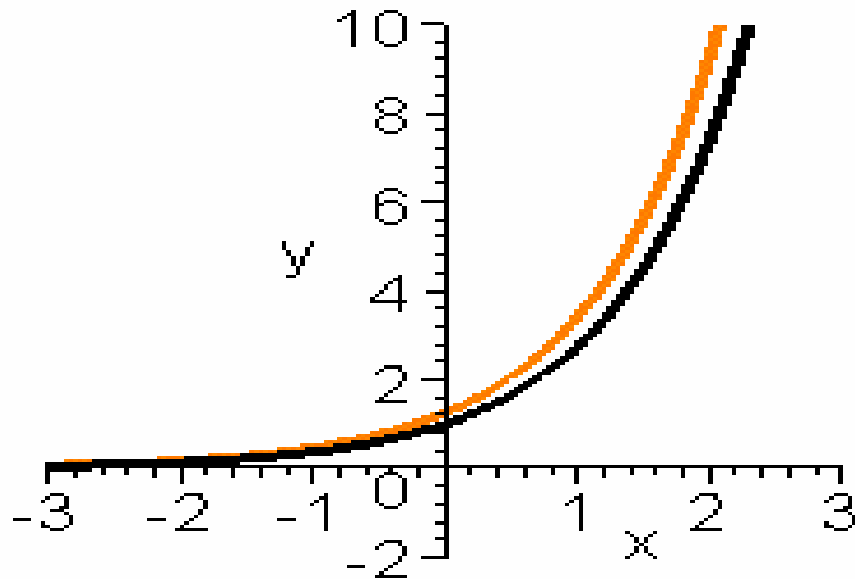
$$y = \frac{5}{4} e^x$$

How will the  
graph look?

# Let's Graph

$$y = e^x$$

$$y = \frac{5}{4}e^x$$



Given the following function,

$$y = 4 + 5e^{(x-1)}$$

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

$$x - 1 = 0$$

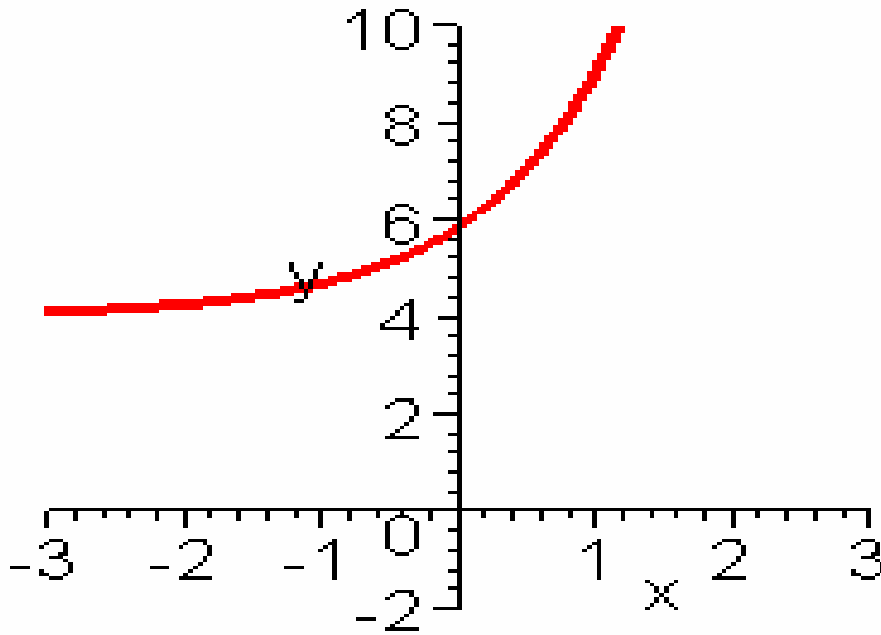
$$x = 1$$

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

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

# Let's Graph

$$y = 4 + 5e^{x-1}$$

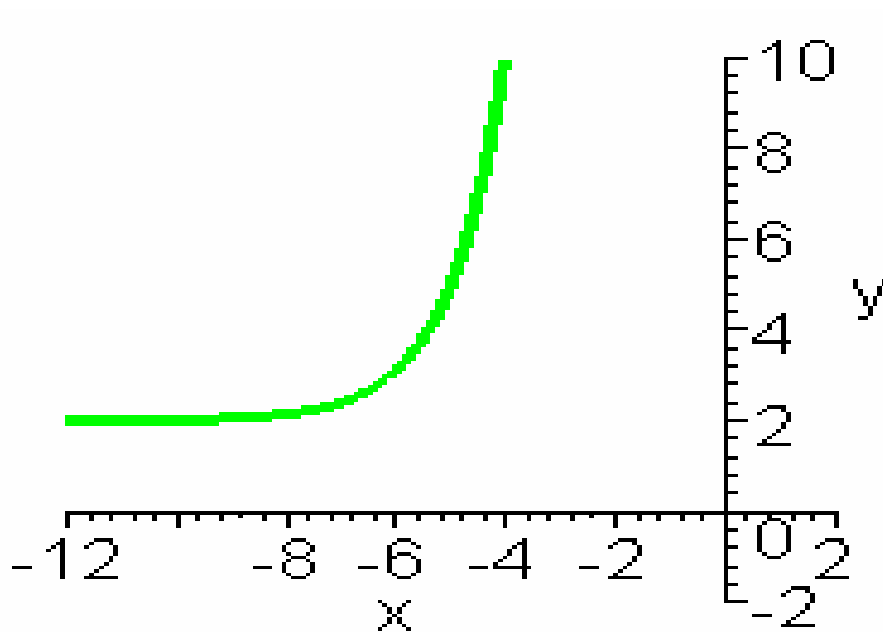


$$y = 2 + 3e^{x+5}$$

How will the  
graph look?

# Let's Graph

$$y = 2 + 3e^{x+5}$$

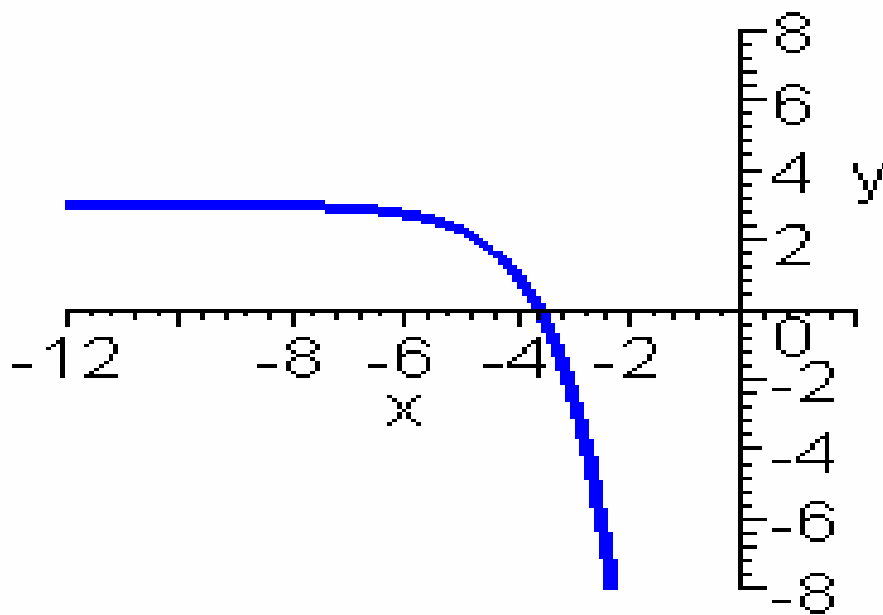


$$y = 3 - 2e^{x+4}$$

How will the  
graph look?

# Let's Graph

$$y = 3 - 2e^{x+4}$$

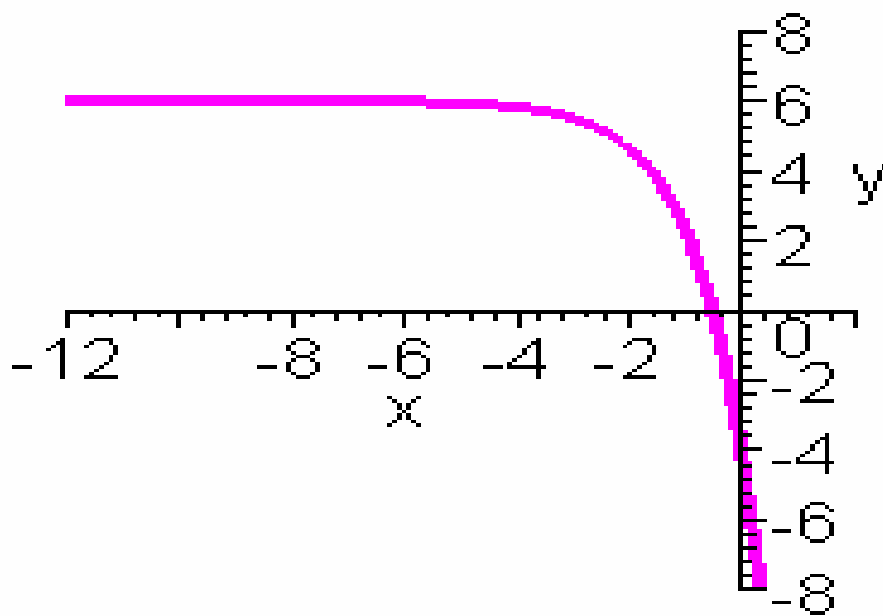


$$y = 6 - \frac{1}{2}e^{x+3}$$

How will the  
graph look?

# Let's Graph

$$y = 6 - \frac{1}{2}e^{x+3}$$

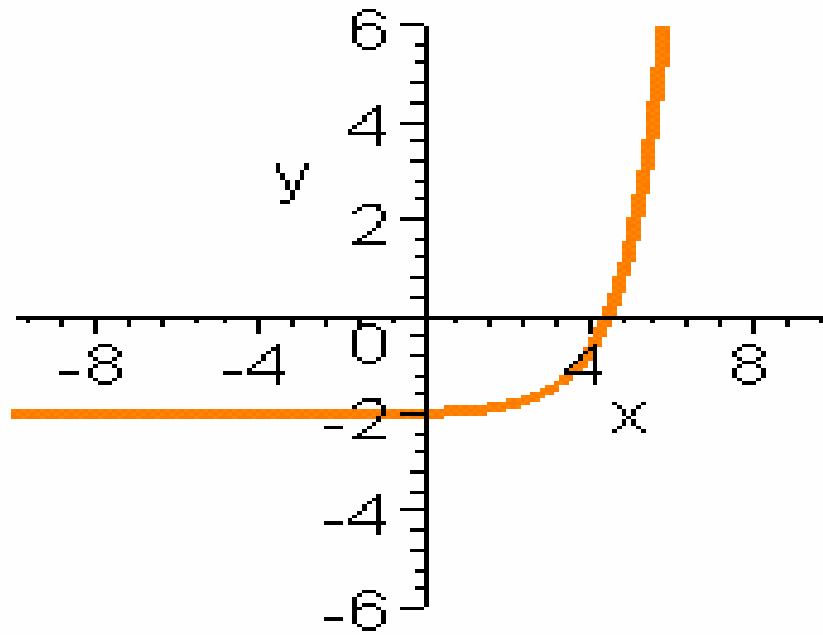


$$y = -2 + \frac{5}{4}e^{x-4}$$

How will the  
graph look?

# Let's Graph

$$y = -2 + \frac{5}{4}e^{x-4}$$

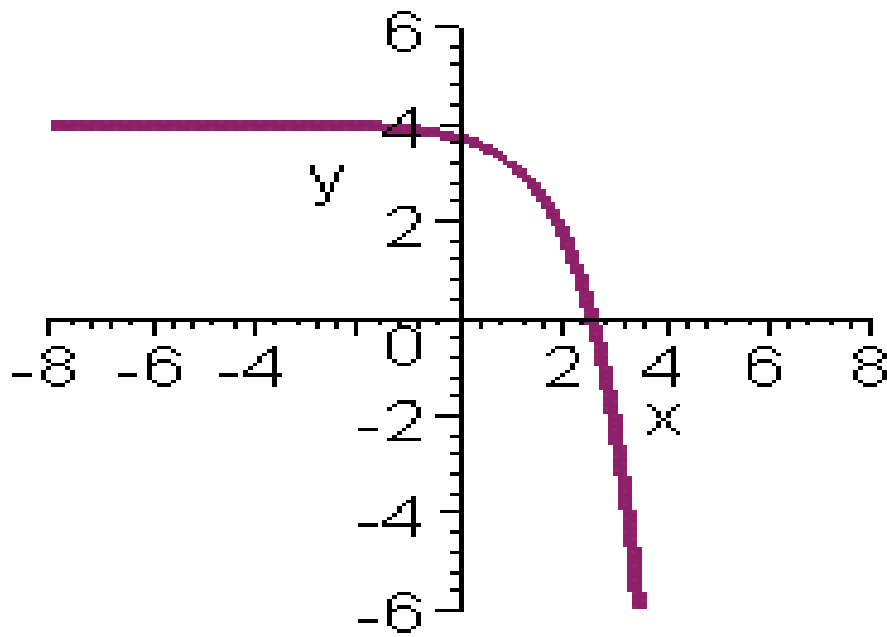


$$y = 4 - \frac{9}{4}e^{x-2}$$

How will the  
graph look?

# Let's Graph

$$y = 4 - \frac{9}{4}e^{x-2}$$

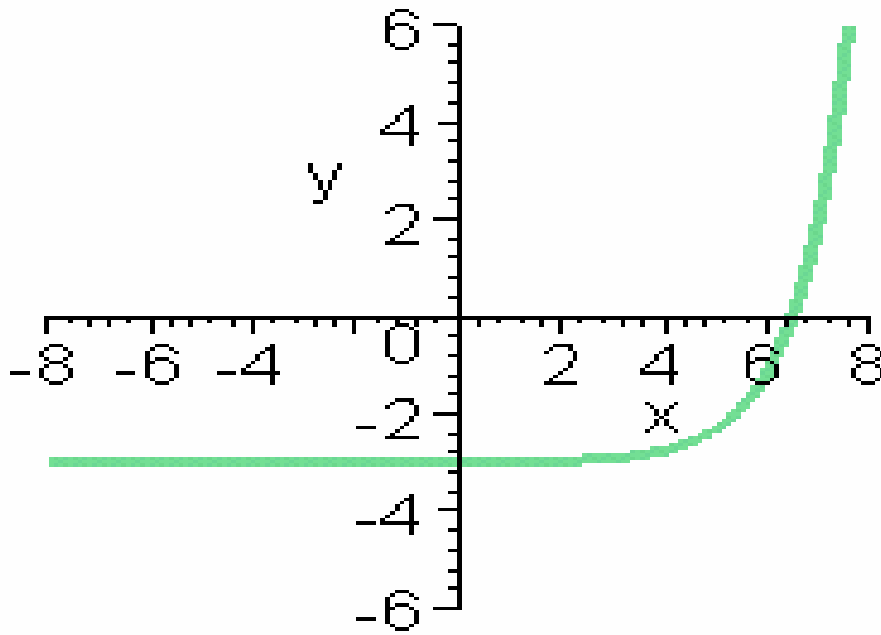


$$y = -3 + \frac{2}{3}e^{x-5}$$

How will the  
graph look?

# Let's Graph

$$y = -3 + \frac{2}{3}e^{x-5}$$

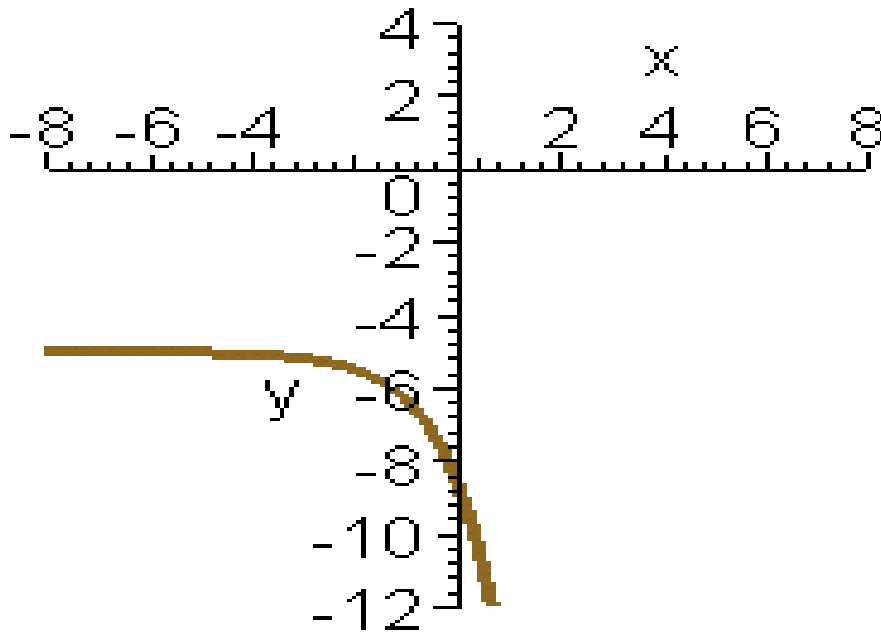


$$y = -5 - \frac{4}{3}e^{x+1}$$

How will the  
graph look?

# Let's Graph

$$y = -5 - \frac{4}{3}e^{x+1}$$



# Congratulations!!

You just completed the  
transformation of

$$y = e^x$$