What's Going On?

Checking In   F.F.M.
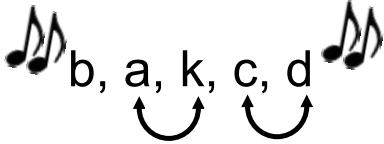
Minds on   b, a, k, c, d

Action!   Graphing $g(x) = a \times b^{k(x-d)} + c$

Consolidation   Exit Question

Learning Goal - I will be able to graph transformations of exponential functions.

Checking In

F.F.M.

Sketch ROUGH graphs (no graph paper allowed) of:

$$g(x) = -2(3^x)$$

$$h(x) = 3^x - 5$$

$$j(x) = 3^{x+2}$$

You must label at least 2 points on each curve

USE A GRID THAT RUNS FROM -10 to +10 on the x and y axes

$$g(x) = -2(3^x)$$

$$h(x) = 3^x - 5$$

$$j(x) = 3^{x+2}$$

$$x - (-2)$$

$$f(x) = 3^x$$

$$g(x)$$

$$b \quad a \quad k \quad c \quad d$$

graph base
function
first
$(y = 2^x)$
- y-int = 1
- doubles every time
- x increases by 1

multiply each
y-value by
a

divide
each x-value
by k

add c to
each y-value

add d to
each x-value
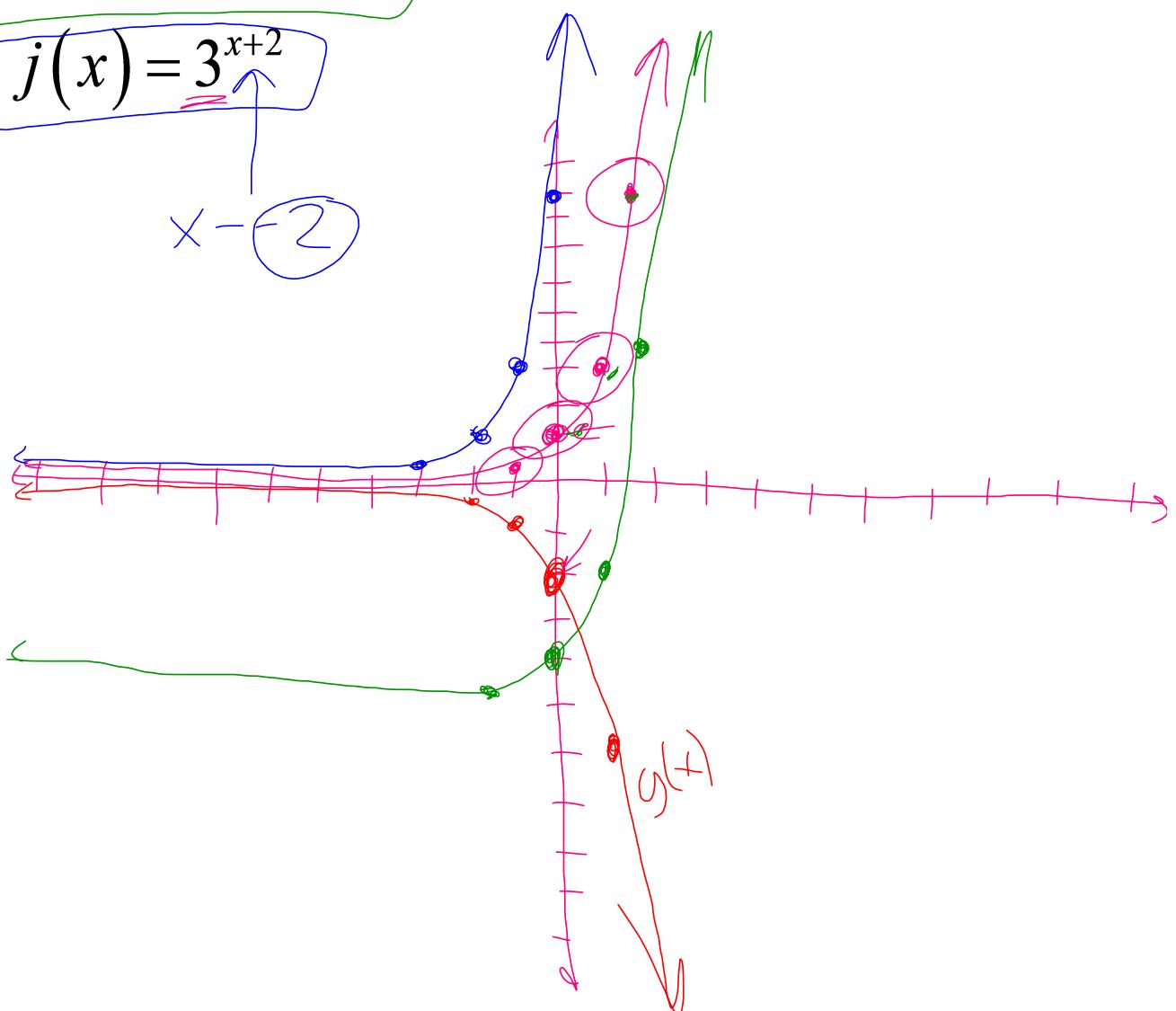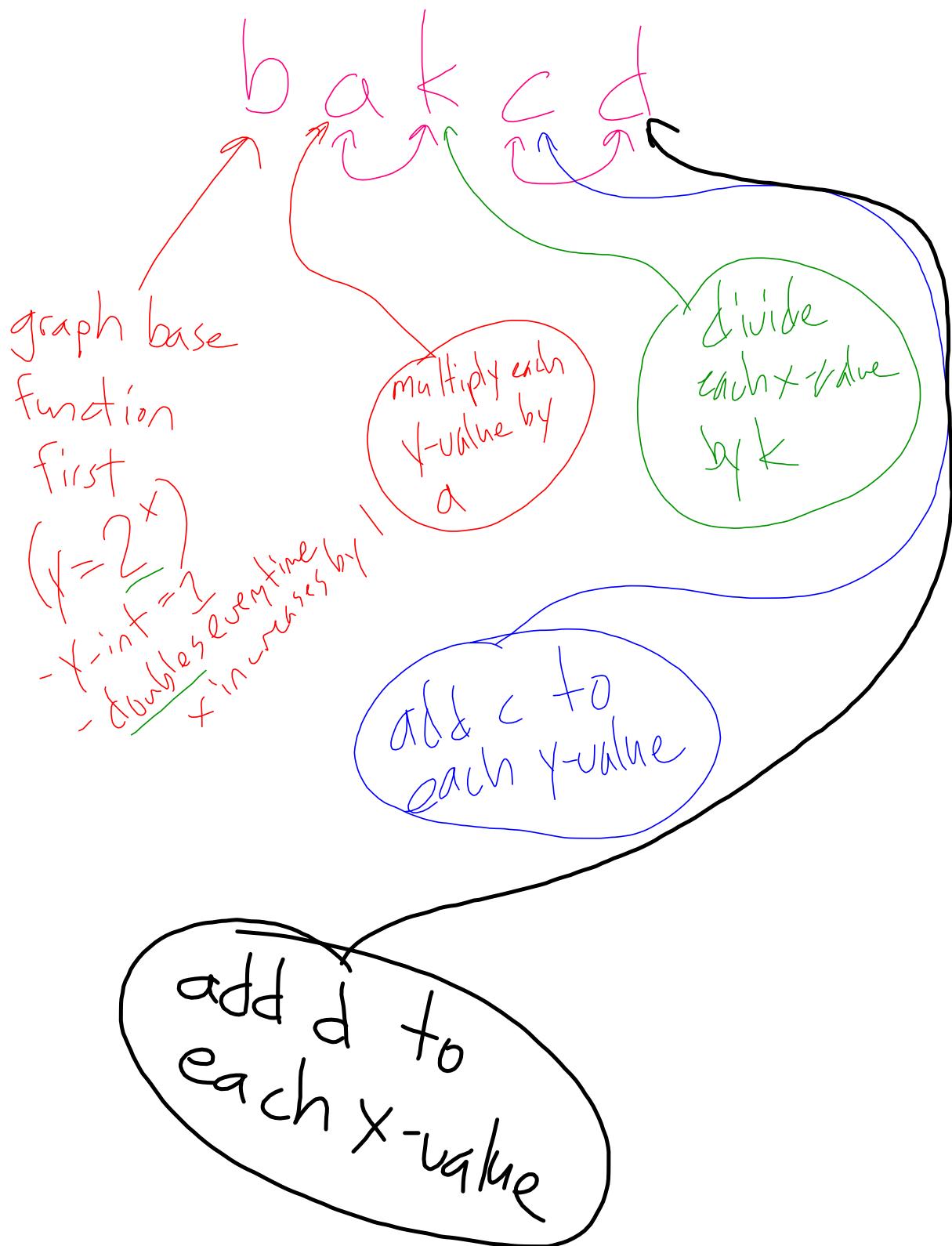
> **Action!**

Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -0.25\left(2^{-2(x+12)}\right) + 16$$

Steps to Graphing:

1. Graph $y = 2^x$
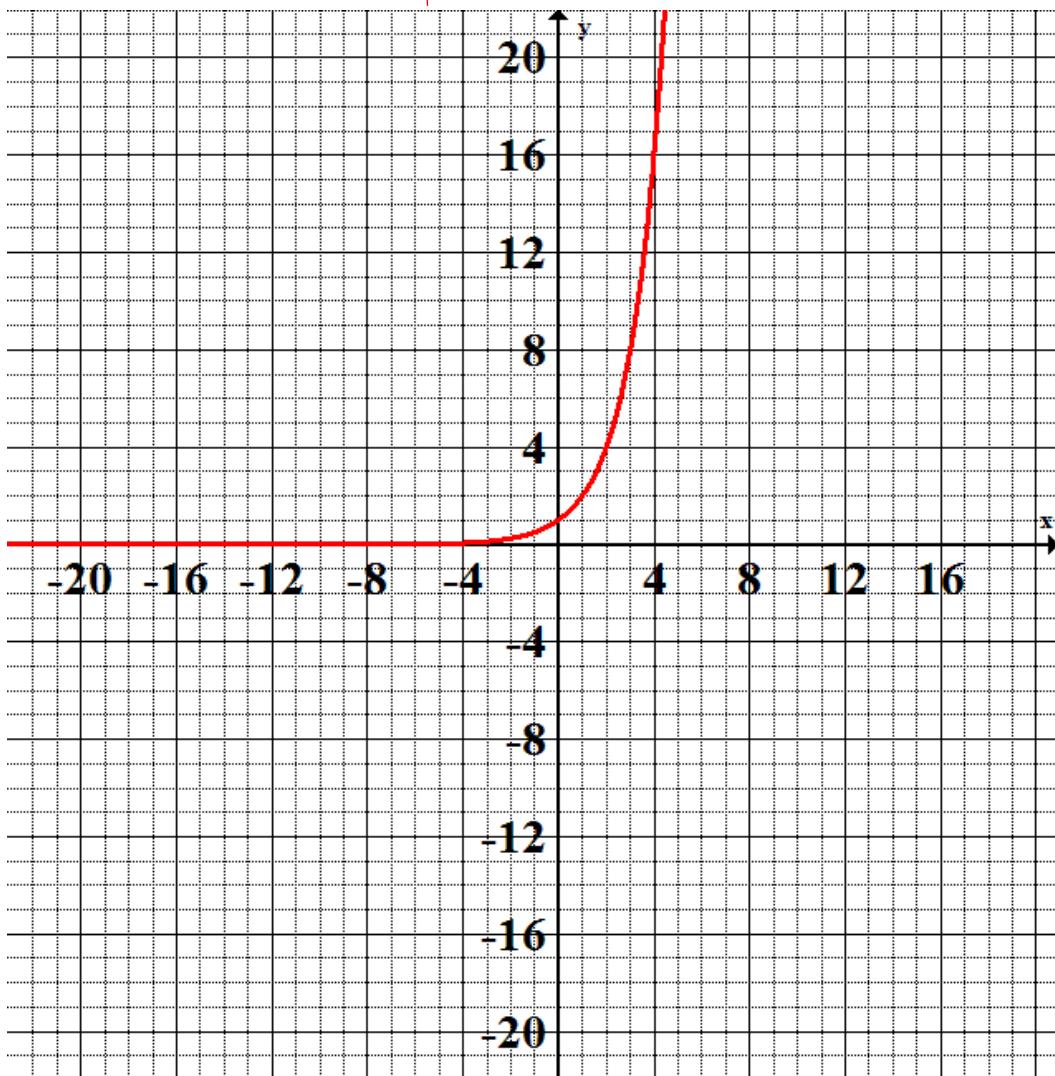
| Action!

# Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -0.25\left(2^{-2(x+12)}\right) + 16$$

Steps to Graphing:

2. Graph $y = -0.25 \times 2^x$ by multiplying each y-value by -0.25.

Action!

Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -0.25\left(2^{-2(x+12)}\right) + 16$$

(with handwritten annotation: k pointing to the exponent -2)
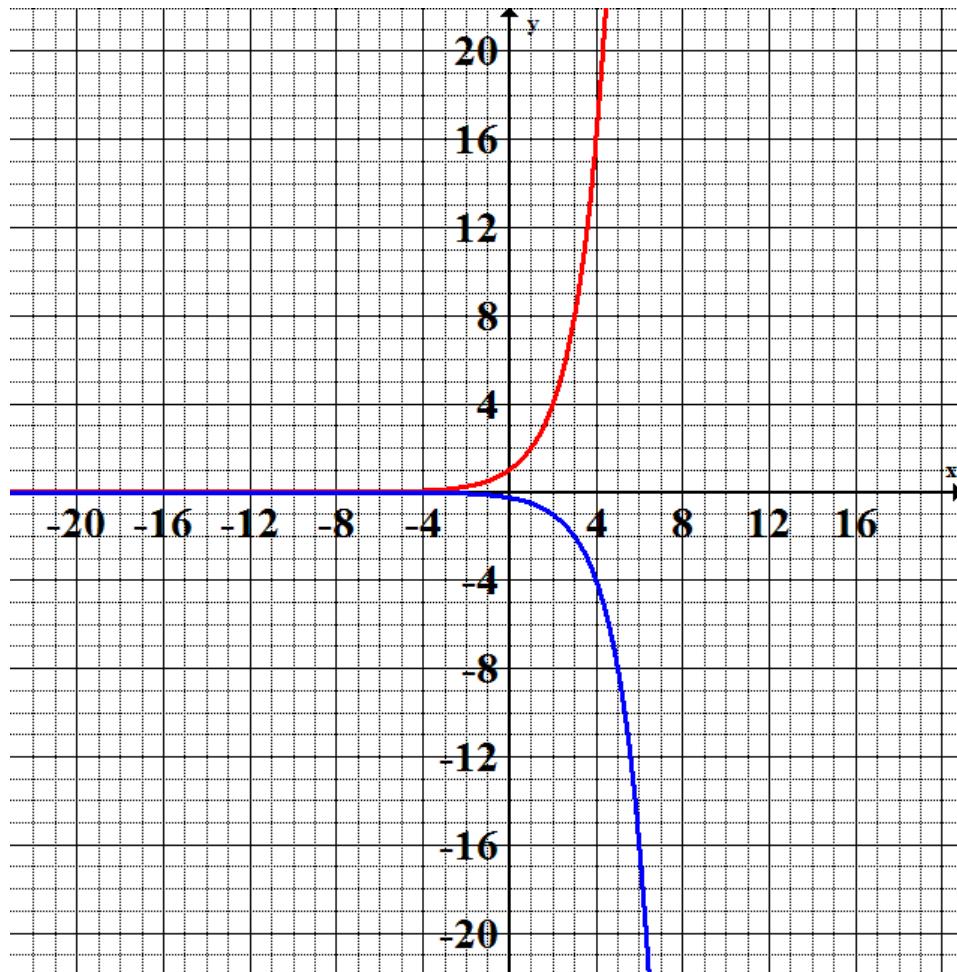
Steps to Graphing:

3. Divide each x-value by -2.

(Graph with handwritten annotations:
- Red curve labeled $y=2^x$ circled with ①
- Green curve labeled $y=-0.25\times 2^{-2x}$ circled with ③
- Blue curve labeled $y=-0.5\times 2^{-x}$ circled with ②)

Action!

Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -0.25\left(2^{-2(x+12)}\right) + 16$$

d = -12
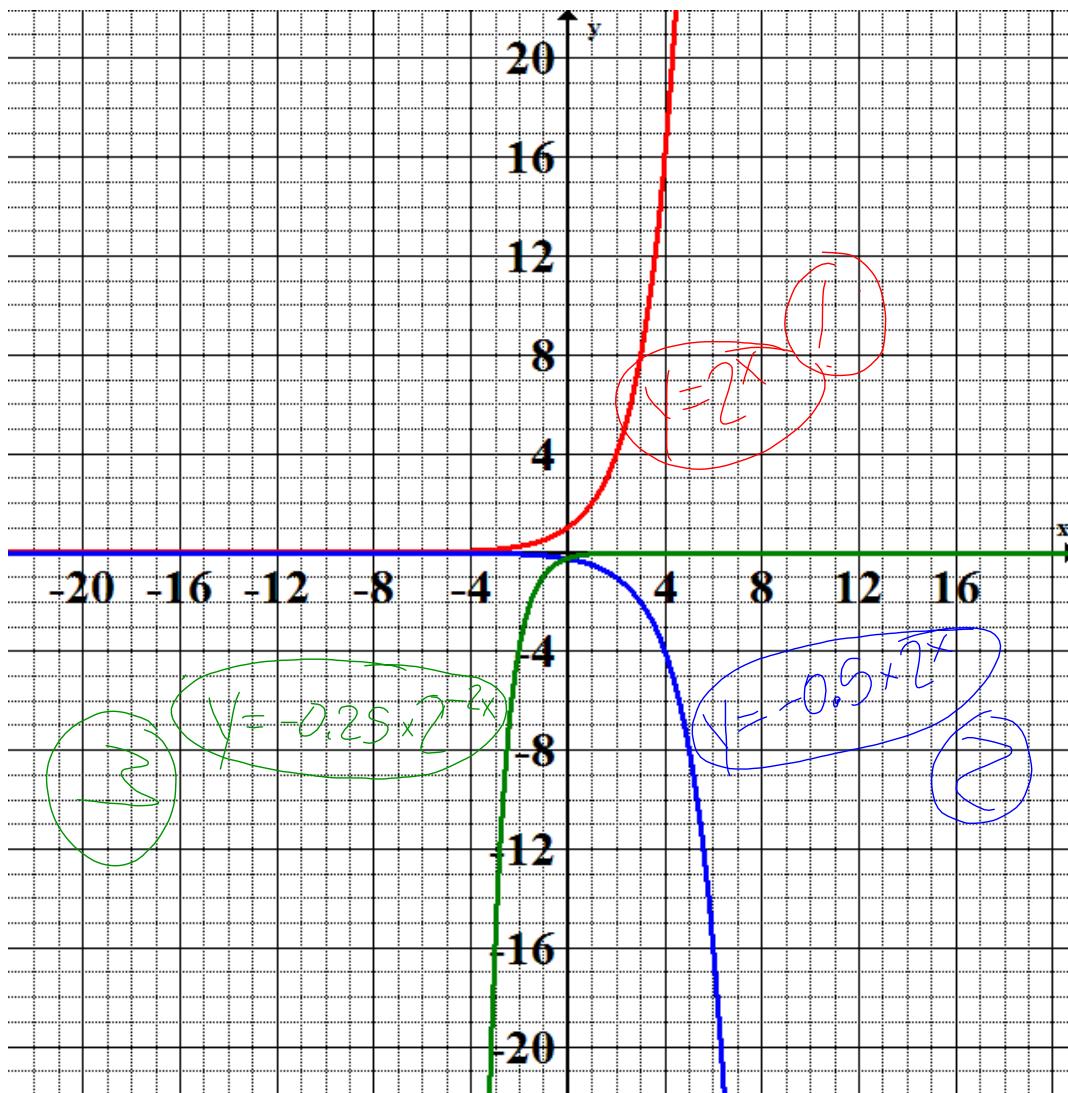
Steps to Graphing:

4. Shift the curve 12 units to the left. (Subtract 12 from each x-value.
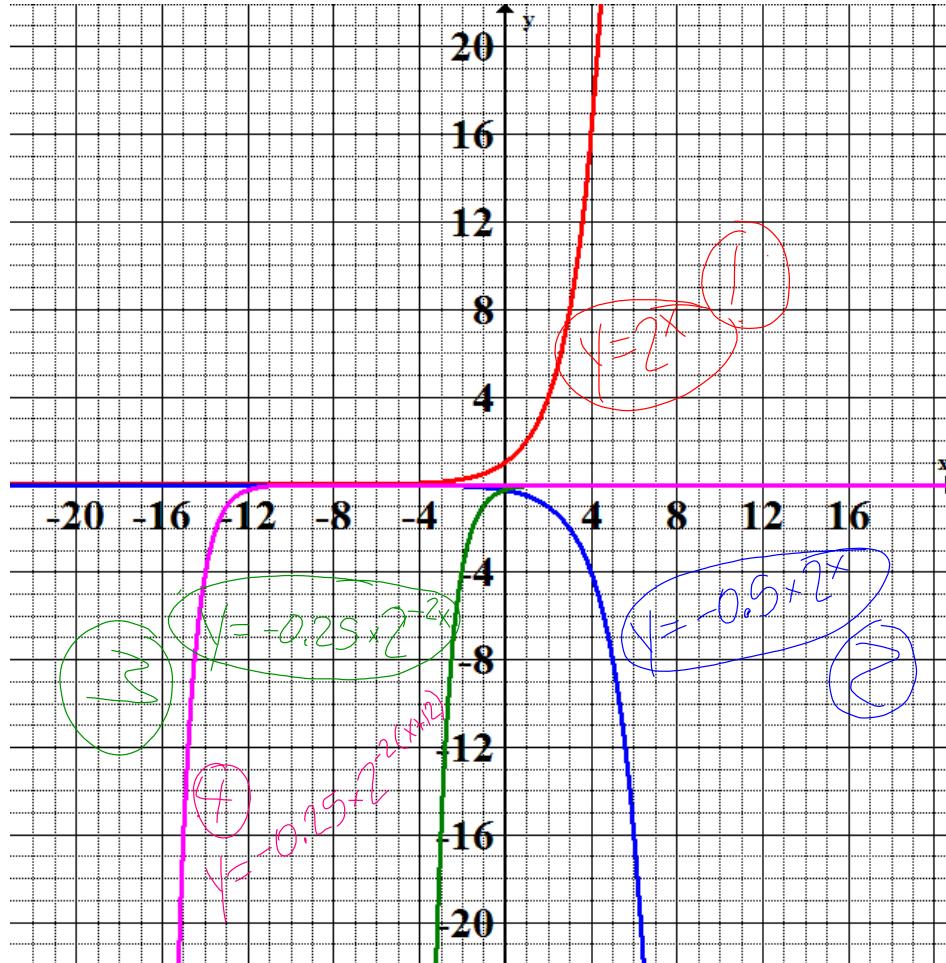
> **Action!**

# Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -0.25\left(2^{-2(x+12)}\right) + 16$$

Steps to Graphing:

5. Shift the curve up 16 units. Add 16 to each y-value.
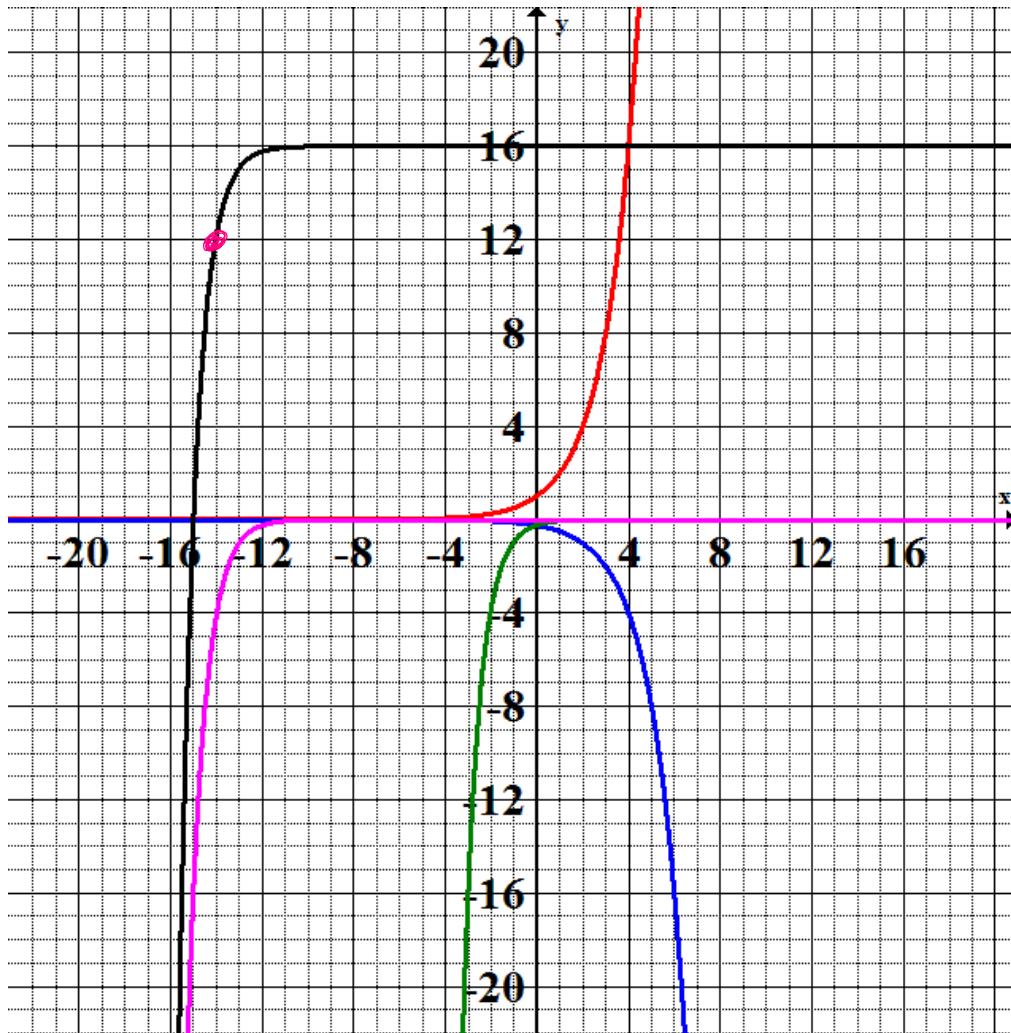
The Table Method

To use the "table method"

   1. Create a table of values for your base function

   2. Apply the transformations to your:

     x-values (divide by k then add d)

     y-values (multiply by a then add c).

$y = 2^x$

x	y
-2	0.25
-1	0.5
0	1
1	2
2	4
3	8
4	16

$\Rightarrow$

$k = -2 \qquad a = -0.25$

$\dfrac{x}{-2}$	$-0.25y$
1	-0.0625
0.5	-0.125
0	-0.25
-0.5	-0.5
-1	-1
-1.5	-2
-2	-4
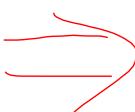
Stretches & Compressions

$\dfrac{x}{2}$	$-0.25y$
1	-0.0625
0.5	-0.125
0	-0.25
-0.5	-0.5
-1	-1
-1.5	-2
-2	-4

$\Rightarrow$

$\dfrac{x}{-2}$ $\;d=-12$ $\;-12$	$-0.25y$ $\;c=16$ $+16$
-11	15.9375
-11.5	15.875
-12	15.75
-12.5	15.5
-13	15
-13.5	14
-14	12

▌**Action!**

Graphing $g(x) = a \times b^{k(x-d)} + c$

Graph:

$$g(x) = -\frac{1}{10} \times 5^{\boxed{3x-9}} + 10$$

notin $k(x-d)$ form

Steps to Graphing:

1. Factor $3x-9$ to get $k(x-d)$

$$g(x) = \frac{-1}{10} \times 5^{3(x-3)} + 10$$

$a = -\frac{1}{10}$ $d = 3$

$k = 3$

$c = 10$

See Video

Graph:

$$g(x) = -\frac{1}{10} \times 5^{3x-9} + 10$$

SEE PDF SOLUTIONS AND VIDEO

Homework

Pg. 251

The rest of 1 – 10