

Transformations of Exponential Functions

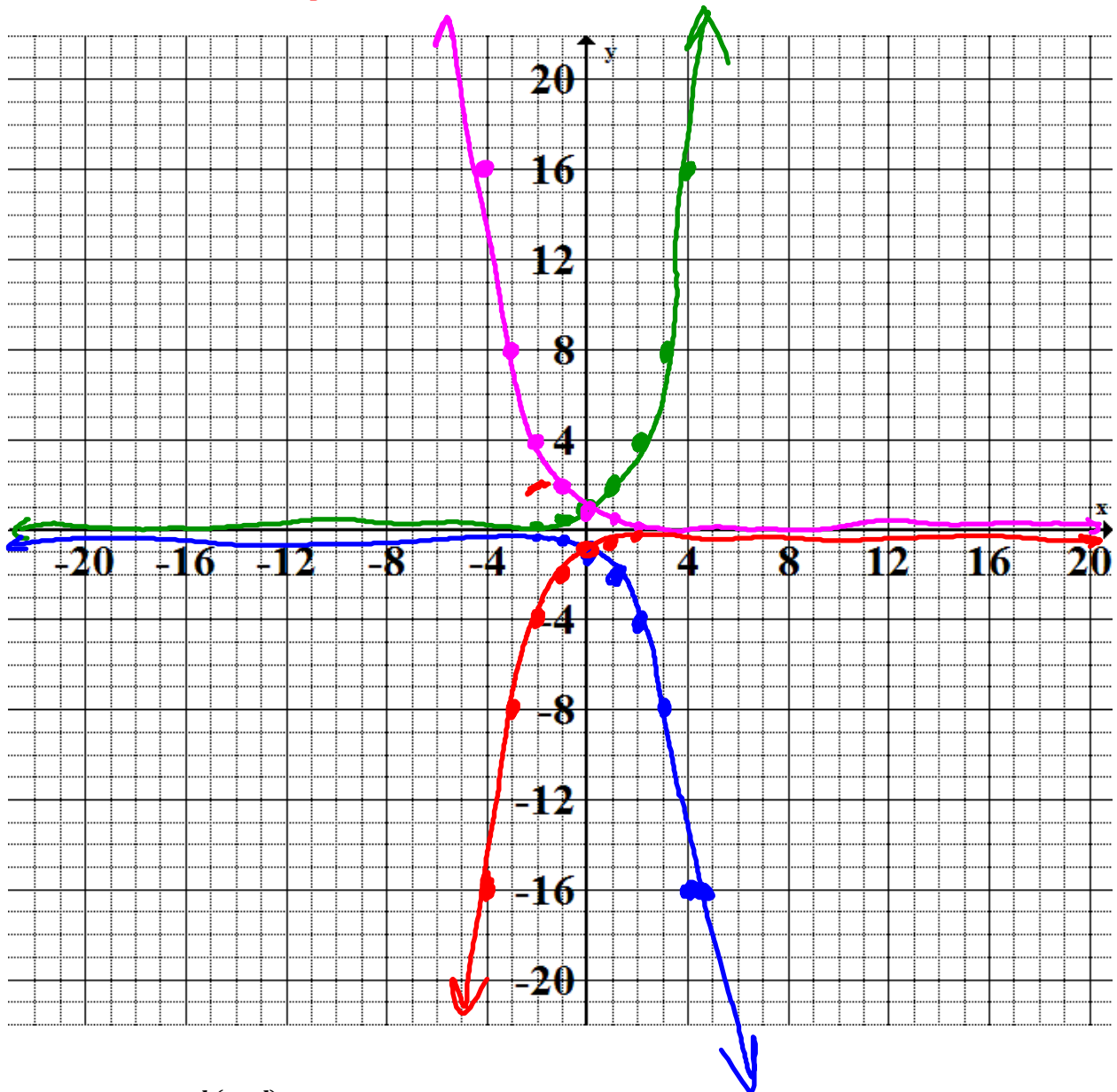
$$f(x) = b^x$$

$$f(x) = 0.5^x$$

$$f(x) = -0.5^x$$

$$f(x) = 2^x$$

$$f(x) = -2^x$$



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

a

see slides

c

see slides

k

see slides

d

see slides

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

$$f(x) = 2^x \quad a=1 \quad d=0 \\ k=1 \quad c=0$$

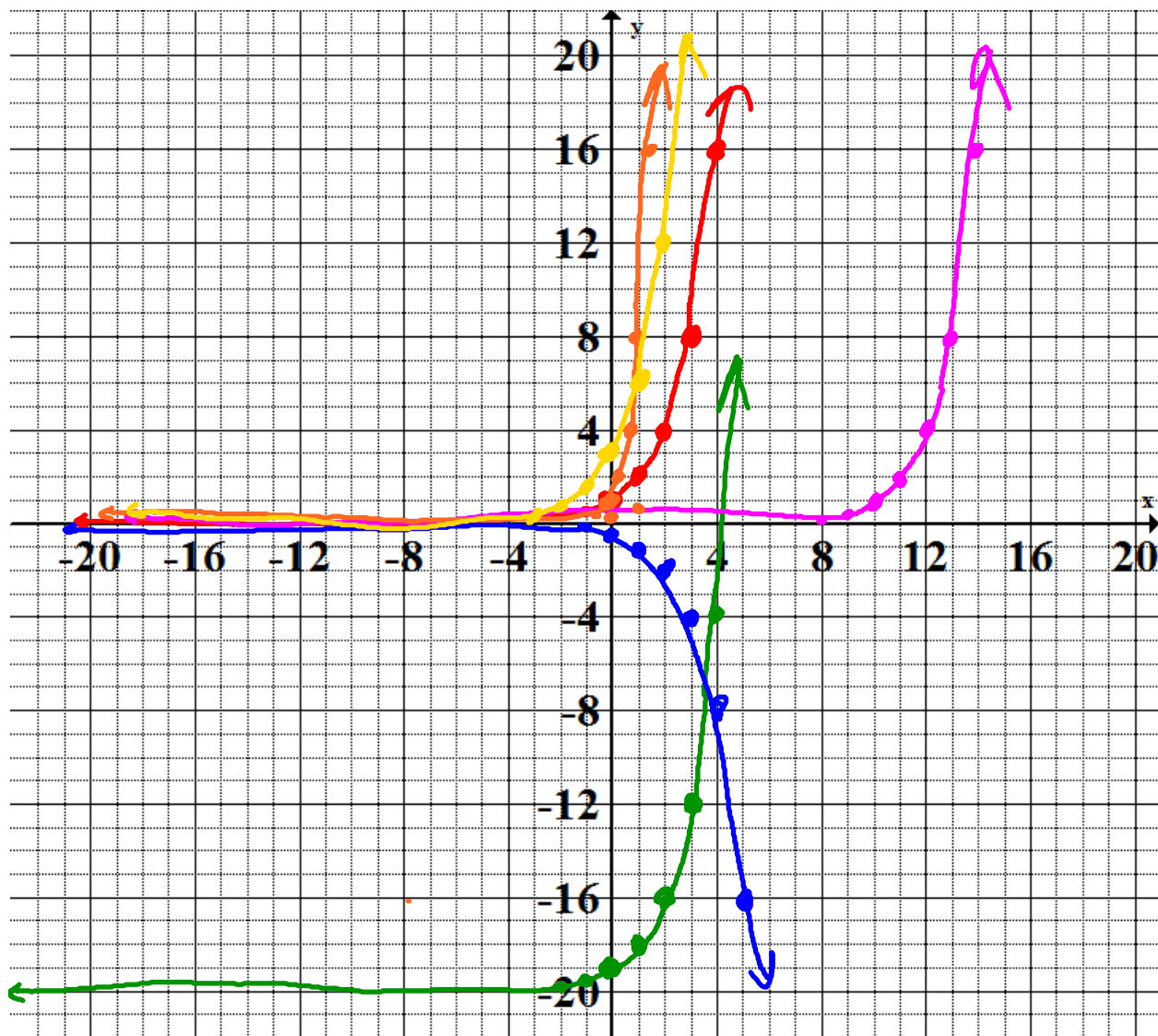
$$g(x) = 2^x - 20 \rightarrow \text{shift } 2^x \text{ down } 20 \\ \rightarrow \text{asymptote is } y = -20 \text{ (value of } c)$$

$$g(x) = -0.5(2^x) \rightarrow a = -0.5 \\ \rightarrow 2^x \text{ has been vertically compressed by } \frac{1}{2} \text{ and reflected in the } x\text{-axis}$$

$$g(x) = 2^{x-10} \rightarrow d = 10 \\ \rightarrow \text{the curve } (2^x) \text{ has been shifted } 10 \text{ units to the right}$$

$$g(x) = 2^{3x} \rightarrow k = 3 \\ \rightarrow \text{horizontally compressed by a factor of } 3$$

$$g(x) = 3(2^x) \rightarrow a = 3 \\ \rightarrow \text{vertically stretched by a factor of } 3$$

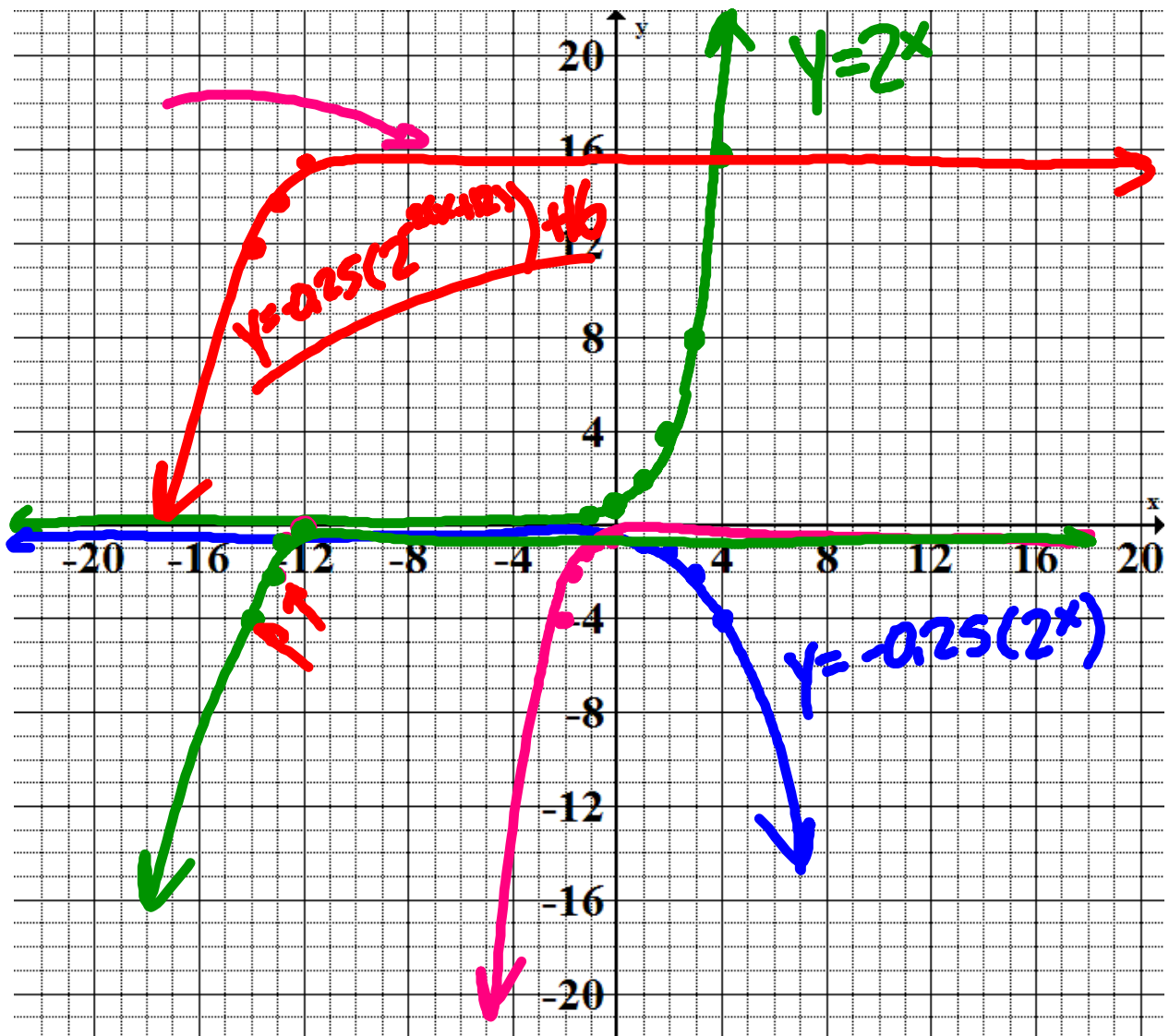


$$g(x) = -0.25(2^{-2(x+12)}) + 16$$

$a = -0.25$ (blue circle)
 $k = 12$ (pink circle)
 $d = -12$ (green circle)
 $c = 16$ (red circle)

Steps to Graphing:

1. Graph the base function: $y = 2^x$
2. Graph $y = -0.25(2^x)$
3. Graph $y = -0.25(2^{2x})$
4. Graph $y = -0.25(2^{-2(x+12)})$
5. Graph $y = -0.25(2^{-2(x+12)}) + 16$



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

$$g(x) = a \times b^{f(x)+c} + C$$

Steps to Graphing:

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

$y = 5x$

x	y
-3	0.004
-2	0.04
-1	0.2
0	1
1	5
2	25

$\frac{x}{3} + 3$

$\frac{x}{3} + 3$	$\frac{y}{10} + 10$
2	9.99
2.333	9.99
2.67	9.98
3	9.9
3.33	9.5
3.67	7.5

