

U4D7_T Stretch, Compress and Combine Transformations of Exponential Functions

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U4D7_T
Stretch, C...

FIRE DRILL

U4D7 MCR3UI

Transformations of Exponential Functions

General Equation of an Exponential Function:

$$y = a(b)^{k(x-d)} + c$$

$a < 0 \Rightarrow$ reflection in x-axis

$k < 0 \Rightarrow$ reflection in y-axis

$0 < |a| < 1 \Rightarrow$ Vertical Compression factor

$|a| > 1 \Rightarrow$ Vertical Stretch factor

$0 < |k| < 1 \Rightarrow$ Horizontal Stretch factor

$|k| > 1 \Rightarrow$ Horizontal Compression factor

$d \Rightarrow$ shift right/left ($d > 0 \Rightarrow$ right, $d < 0 \Rightarrow$ left)

$c \Rightarrow$ shift up/down ($c > 0 \Rightarrow$ up, $c < 0 \Rightarrow$ down)

1. Match each transformation with the corresponding equation, using $f(x) = 10^x$ as the base. Not all transformations will match an equation.

Transformation	Equation
a) Horizontal stretch factor 3 \rightarrow	A $y = 10^x + 3$
b) Shift 3 units up \rightarrow	B $y = 10^{x+3}$
c) Shift 3 units left \rightarrow	C $y = -10^x$
d) Vertical compression factor $\frac{1}{3}$ \rightarrow	D $y = 10^x - 3$
e) Vertical stretch factor 3 \rightarrow	E $y = 10^{3x}$
f) Shift 3 units right \rightarrow	F $y = 10^{-x}$ reflection in y-axis
g) Reflect in x-axis \rightarrow	G $y = \left(\frac{1}{3}\right)10^x$
h) Shift 3 units down \rightarrow	
i) Horizontal compression factor $\frac{1}{3}$ \rightarrow	

Handwritten notes in green:
 - Transformation a: $y = 10^{\frac{1}{3}x}$
 - Transformation b: $y = 10^{x+3}$
 - Transformation c: $y = 10^{x-3}$
 - Transformation e: $y = 3(10^x)$
 - Transformation f: $y = 10^{x-3}$
 - Transformation g: $y = 10^{-x}$
 - Transformation i: $y = \left(\frac{1}{3}\right)10^x$

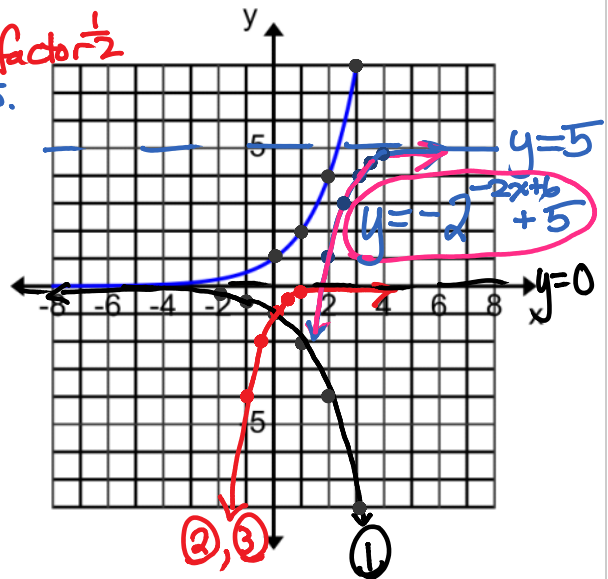
4. a) Identify the transformations of $f(x) = 2^x$ that will produce the graph of $y = -f(-2x + 6) + 5$, and determine the new equation.

- ① reflection in x -axis
- ② reflection in y -axis
- ③ horizontal compression factor $\frac{1}{2}$
- ④ shift right 3, up 5 units.

$$y = -2^{-2x+6} + 5$$

$$y = -2^{-2(x-3)} + 5$$

b) Graph the transformation.
Label the final graph with its equation.



5. Apply the appropriate transformations to the exponential function to graph the following and state the domain and range.

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

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

- ① reflect in x -axis,
- ② vertical stretch factor 2
- ③ reflect in y -axis
- ④ shift right 3, up 6

$$D: \{ x \in \mathbb{R} \}$$

$$R: \{ y < 6 \}$$

