

Graphing Functions (1.4)



"Given a function, I can describe all transformations applied to its parent function. I can determine all ordered pairs of transformed functions using the graphical, algebraic and numerical techniques. I can apply what I have learned in familiar and unfamiliar settings."

The function $y = f(x)$ can be transformed into $y = af[k(x-d)] + c$

The role of a, k, d and $c...$

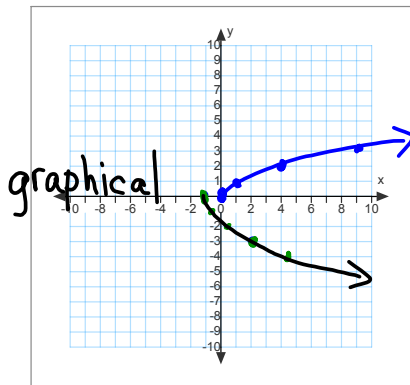
Factored

Practice: Transforming Functions. Click here.

Example 1 State the function that would result from horizontally compressing $y = f(x)$ by a factor of 0.25, and then translating it 3 units left. $y = f[4(x+3)]$

Example 2 Given: $f(x) = \sqrt{x}$
 a) Describe the transformations defined by $y = -f[3x+3]$ in the order they would be applied to $f(x) = \sqrt{x}$
 b) Graph $y = -f[3x+3]$ using several techniques.
 c) State the new equation of the transformed function.
 d) Complete the table.

numeric, graphical, algebraic. →



$y = -f[3(x+1)]$

- reflection in x-axis
- horizontal compression factor $\frac{1}{3}$
- horizontal translation 1 left

Numeric		Numeric	
x	$f(x)$	x	$-f[3(x+1)]$
0	0	$0 \cdot \frac{1}{3} - 1$	$0 \cdot -1$
1	1	$1 \cdot \frac{1}{3} - 1$	$1 \cdot -1$
4	2	$4 \cdot \frac{1}{3} - 1$	$2 \cdot -1$
9	3	$9 \cdot \frac{1}{3} - 1$	$3 \cdot -1$

	$y = -f[3x+3]$
Interval(s) of increase	n/a
Interval(s) of decrease	$[-1, \infty)$
End behaviour (s)	As $x \rightarrow \infty, y \rightarrow -\infty$
Symmetry	n/a

algebraic (mapping)
 $(x, y) \rightarrow (x \cdot \frac{1}{3} - 1, y \cdot -1)$

Transformations "Refresher" Pages 1 to 5 click here.

MathSIP!

- Describe the transformations of the parent function in the order applied to create:
 - $f(x) = \sqrt{4x-3}$
 - $y = f(-\frac{1}{3}x + \frac{2}{3}) + 3$
- Page 35 #2, 3*find graphically only, 4de, 5c, 6c, 7, 9*find algebraically only, 13, 15.

Final Answers
 1. a) horizontal compression factor = 4, then a translation right $\frac{3}{4}$ units
 b) reflection in the y-axis, then a horizontal stretch factor of 3, then a horizontal translation right 2 units, finally a vertical translation up 3 units.

$\frac{1}{4}$

TRANSFORMATIONS

1 Pull

$|a| > 1$ vertical stretch factor $|a|$
 $0 < |a| < 1$ vertical compression factor $|a|$
 $a < 0$ reflection in the x-axis

$d > 0$ horizontal translation right d units
 $d < 0$ horizontal translation left d units

2 Pull

$|k| > 1$ horizontal compression factor $\frac{1}{|k|}$
 $0 < |k| < 1$ horizontal stretch factor $\frac{1}{|k|}$
 $k < 0$ reflection in the y-axis

3 Pull

4 Pull

$c > 0$ vertical translation up c units
 $c < 0$ vertical translation down c units

$$y = af(k(x - d)) + c$$