

(2.3) Transformations of Linear Functions

A transformation of a linear function is when the parameters of the PARENT LINEAR FUNCTION are changed, such as slope and y-intercept.

PARENT LINEAR FUNCTION: $f(x)=x$

Remember

$f(x)=y$ same as (x,y)

$m = \underline{1}$

$b = \underline{0}$

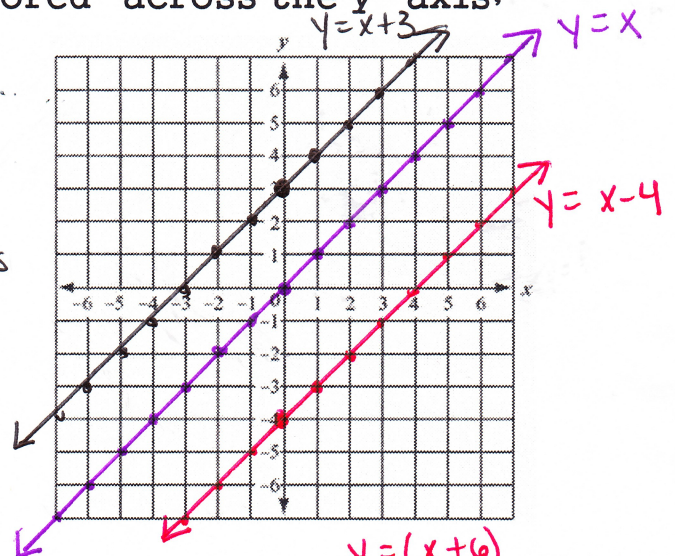
3 TYPES OF TRANSFORMATIONS:

- 1) VERTICAL TRANSLATION – “slides” up or down; only y-intercept changes
- 2) HORIZONTAL TRANSLATION – “slides” left or right; only y-intercept changes
- 3) ROTATION – “turns” left or right; only slope changes
- 4) REFLECTION – “reflected” or “mirrored” across the y-axis; only sign of the slope changes

VERTICAL TRANSLATIONS:

- a) Graph $y = x$
- b) Now graph $y = x + 3$
- c) How did the line change? moved up 3 units
- d) Now graph $y = x - 4$
- e) What PARAMETER is changing in each equation?

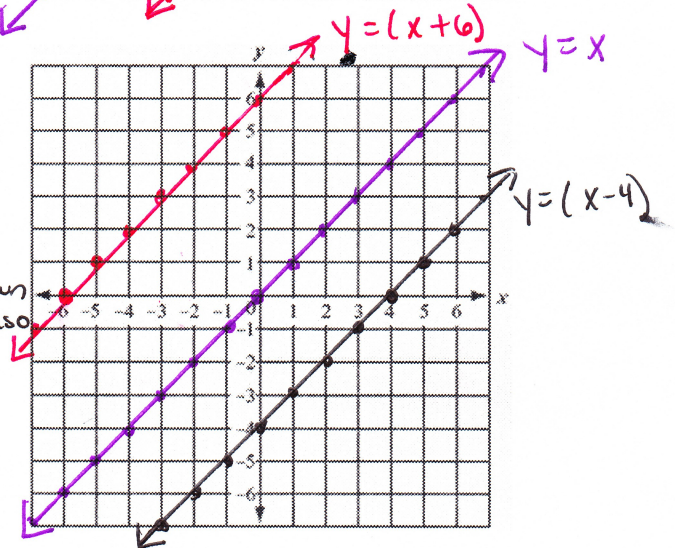
- y-intercept only
slope (m) = 1 in every equation



HORIZONTAL TRANSLATIONS:

- a) Graph $y=x$
- b) Now graph $y = (x-4)$
- c) How did the line change? moved right 4, which moved down 4 also
- d) Now graph $y = (x+6)$
- e) What PARAMETER is changing in each equation?

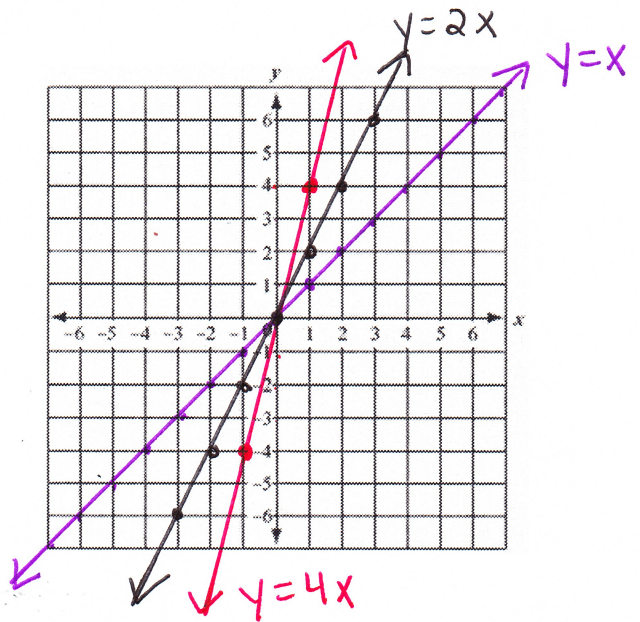
- y-intercept only
slope (m) = 1 in every equation



ROTATIONS:

- a) Graph $y = x$
- b) Now graph $y = 2x$
- c) How did the line change? rotated left - steeper
- d) Now graph $y = 4x$
- e) What PARAMETER is changing in each equation?

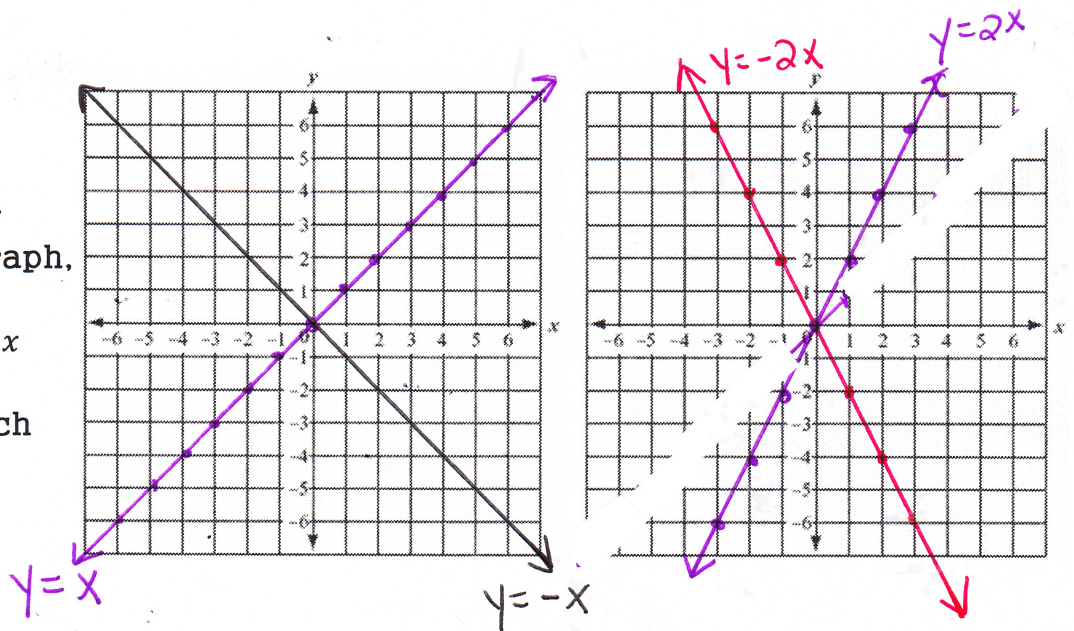
• Slope changed only
 * higher the slope, the steeper the line; the smaller the slope, the less steep the line is



REFLECTIONS:

- a) Graph $y = x$
- b) Now graph $y = -x$
- c) On the second graph, Graph $y = 2x$
- d) Now graph $y = -2x$
- e) What is the difference in each equation?

- Same slope, but reflected across the y-axis



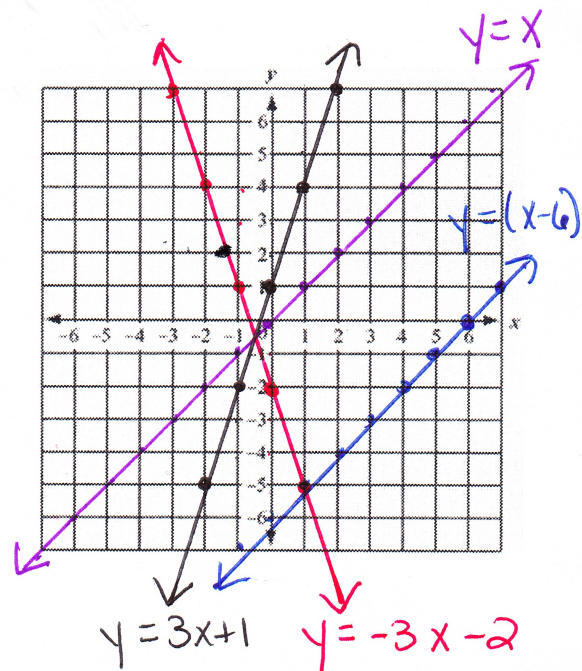
MULTIPLE TRANSFORMATIONS:

- a) Graph $f(x) = x$
- b) Now graph $g(x) = 3x + 1$
- c) Now graph $h(x) = -3x - 2$
- d) Now graph $k(x) = (x-6)$
- e) What transformations occurred? All!
- f) What parameters changed in the equations?

a → b
 rotation and v. translation

b → c
 reflection and translation

c → d
 reflection, rotation, translation ~~vertical~~ horizontal



* if you have a vertical translation, you automatically have a horizontal translation

