S-A2 Algebra 2 Session 8 7/6

Direct Variation $y = kx$ $k = \frac{y}{x}$

If $x = 8$ when $y = 18$

Find y when $x = 12$

k - constant of variation

slope $= \boxed{\frac{\Delta y}{\Delta x}} = \frac{\text{rise}}{\text{run}}$

1.) Find k $k = \frac{y}{x} = \frac{18 \div 2}{8 \div 2} = \frac{9}{4}$

$k = \frac{9}{4}$

2.) Find equation $y = kx$ $y = \frac{9}{4}x$

3.) Plug in x or y. $y = \frac{9}{4}x$

$y = \frac{9}{4}(12) \div 4 = 9(3) = \boxed{27}$

If $x = 20$ when $y = 24$

Find x when $y = 18$

1.) Find k $k = \frac{y}{x} = \frac{24 \div 4}{20 \div 4} = \frac{6}{5}$

2.) Find equation $y = kx$

$y = \frac{6}{5}x$

3.) Plug in x or y.

$y = 18$

$y = \frac{6}{5}x$

$\frac{5}{6}(18) = \left(\frac{6}{5}x\right)\frac{5}{6}$

$x = \frac{5}{\cancel{6}_1}\cancel{(18)}^3 = 5 \cdot 3 = \boxed{15}$

Direct Variation: $y = kx$

through $\{(0,0)\}$

1.) $y = -3x$

yes, direct variation

$k = -3$

2.) $4x = 6y$

$\frac{4x}{6} = \frac{6y}{6}$

$y = \frac{4}{6}x$

$y = \frac{2}{3}x$

yes, direct variation

$k = \frac{2}{3}$

3.) $y = 2x + 3$

No

4.) $8x + 12y = 0$

yes, direct variation

$8x + 12y = 0$

$-8x \quad\quad -8x$

$\frac{12y}{12} = \frac{-8x}{12}$

$y = \frac{-8}{12}x$

$k = \frac{-2}{3}$

$y = \frac{-2}{3}x$

x	y	$k = y/x$
0	0	Definition of direct variation
→ 2	3	$\frac{3}{2}$
-4	-6	$-6/-4 = \frac{3}{2}$
10	15	$\frac{15 \div 5}{10 \div 5} = \frac{3}{2}$

yes, direct variation

$y = \frac{3}{2}x$

1.)

x	y	$k = \frac{y}{x}$
1	3	$\frac{3}{1} = 3$
2	6	$\frac{6}{2} = 3$
3	12	$\frac{12}{3} = 4$

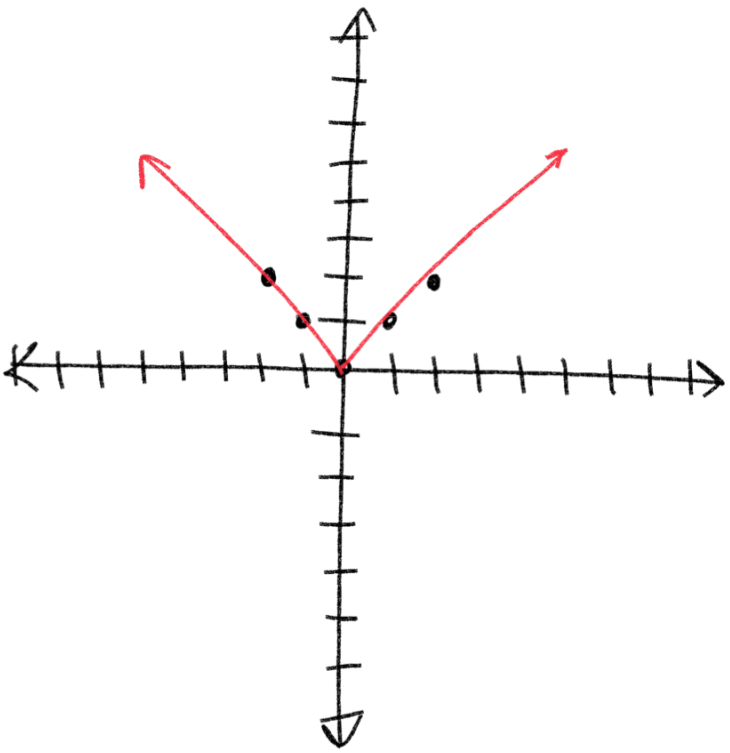
No, direct variation

2.)

x	y	
0	2	$\frac{2}{0}$ undef.
3	6	
-4	-8	

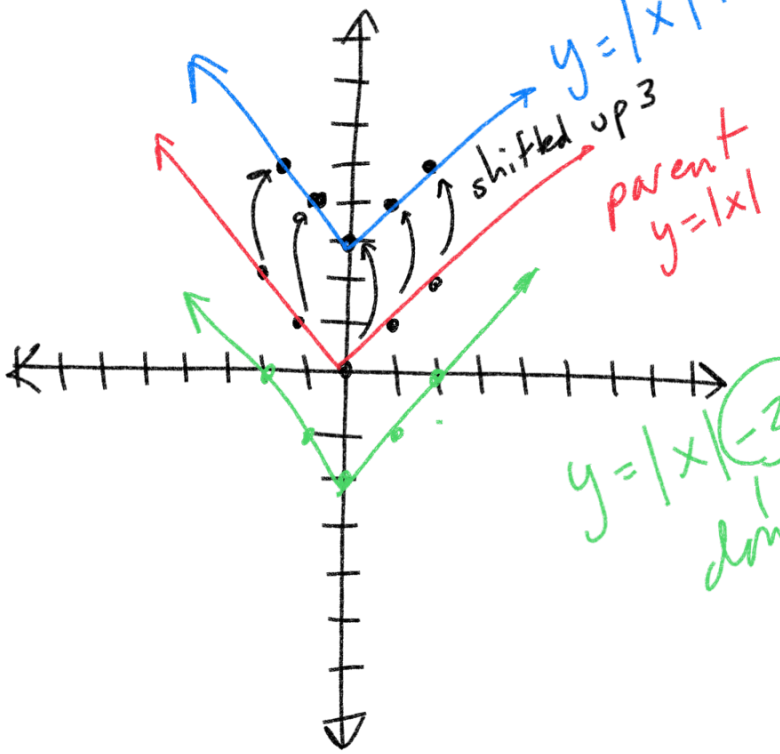
Not direct variation

Absolute Value Functions



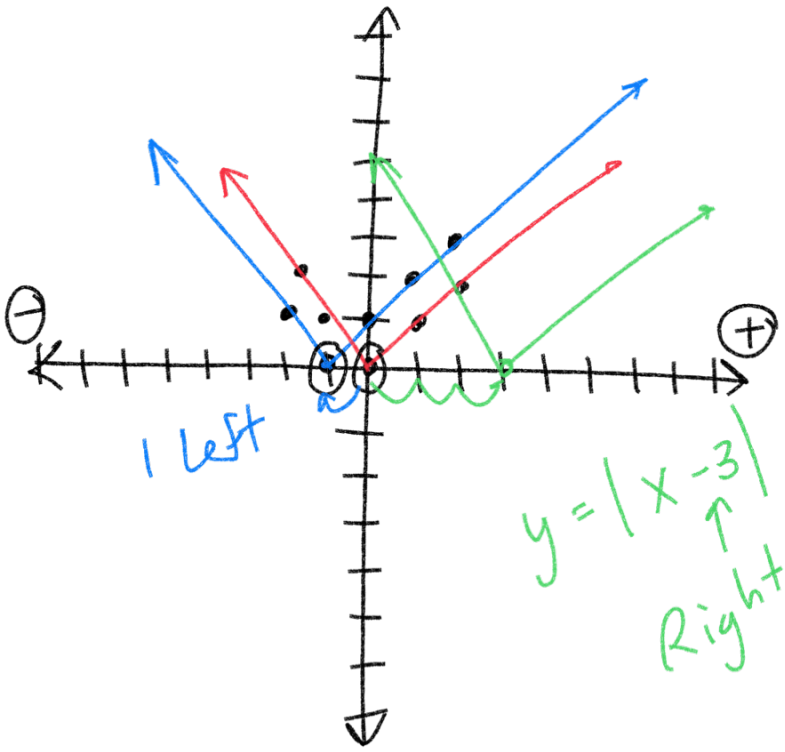
$y = |x|$ parent

x	$\|x\|$	y
-2	$\|-2\|$	2
-1	$\|-1\|$	1
0	$\|0\|$	0
1	$\|1\|$	1
2	$\|2\|$	2



$y = |x| \boxed{+3}$ ← up 3

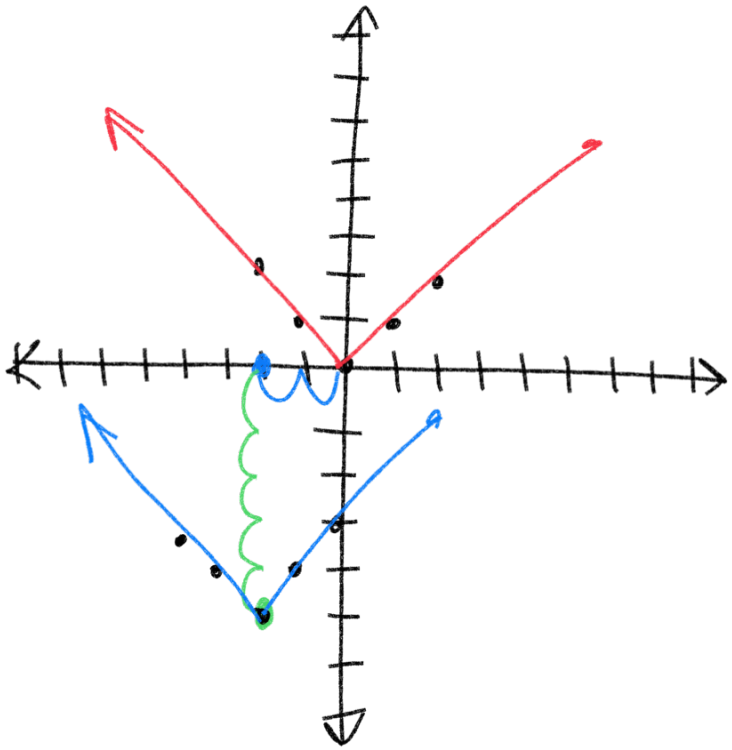
x	$\lvert x \rvert + 3$	y
−2	$\lvert -2 \rvert + 3$ $2 + 3$	5
−1	$\lvert -1 \rvert + 3$ $1 + 3$	4
0	$\lvert 0 \rvert + 3$ $0 + 3$	3
1	$\lvert 1 \rvert + 3$ $1 + 3$	4
2	$\lvert 2 \rvert + 3$ $2 + 3$	5



$y = |x + 1|$

Left 1

x	$\lvert x + 1 \rvert$	y
−2	$\lvert -2 + 1 \rvert = \lvert -1 \rvert$	1
−1	$\lvert -1 + 1 \rvert = \lvert 0 \rvert$	0
0	$\lvert 0 + 1 \rvert = \lvert 1 \rvert$	1
1	$\lvert 1 + 1 \rvert = \lvert 2 \rvert$	2
2	$\lvert 2 + 1 \rvert = \lvert 3 \rvert$	3



$y = |x + 2| - 5$

opposite

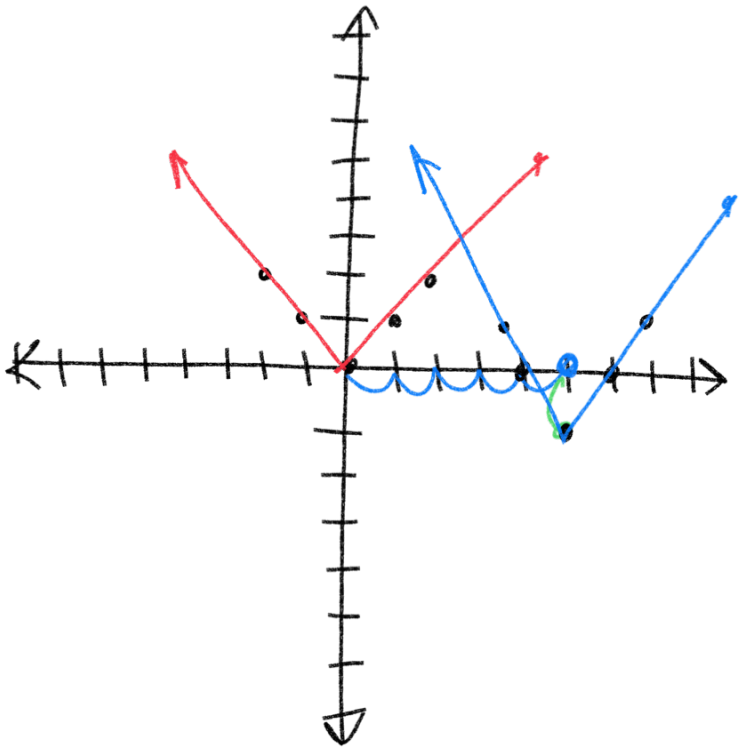
2 Left

down 5

$y = |x \pm \square| \pm \square$

opposite

literal



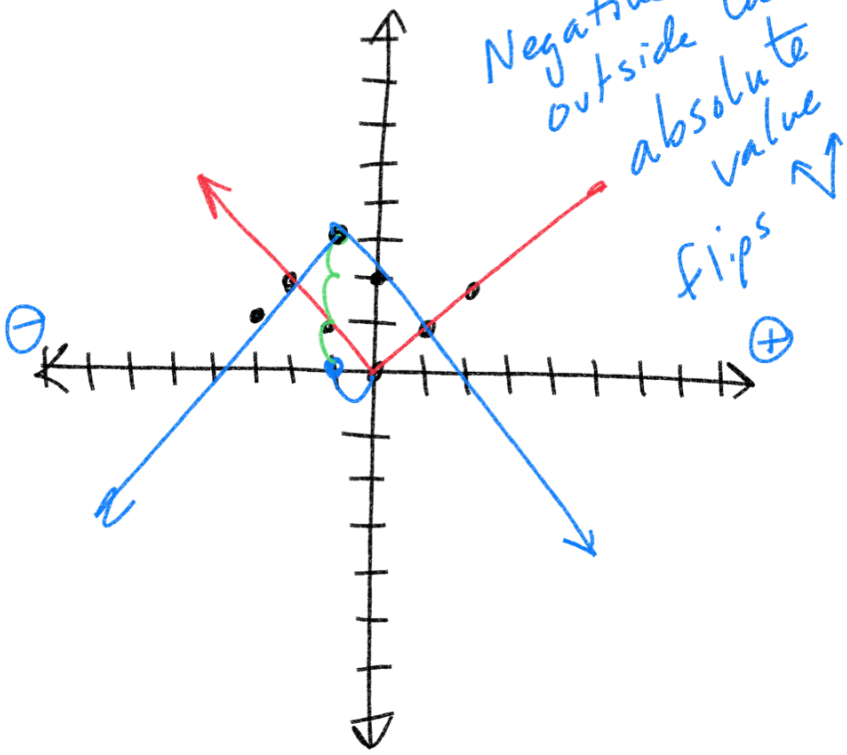
$y = |x - 5| - 1$

horizontal movement

vertical

Right 5

down 1



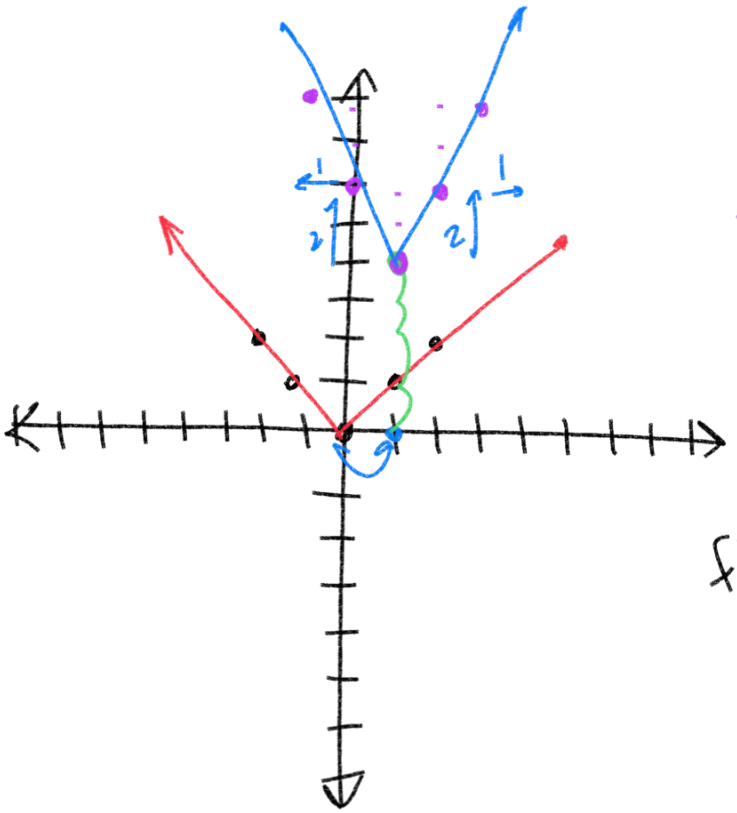
$y = -|x+1|+3$

opposite

flip upside down

Left 1

3 up



you must factor out!

$y = |2x-2|+4$

$\frac{2}{2} \quad \frac{-2}{2}$

up 2 / 1 right

Slope

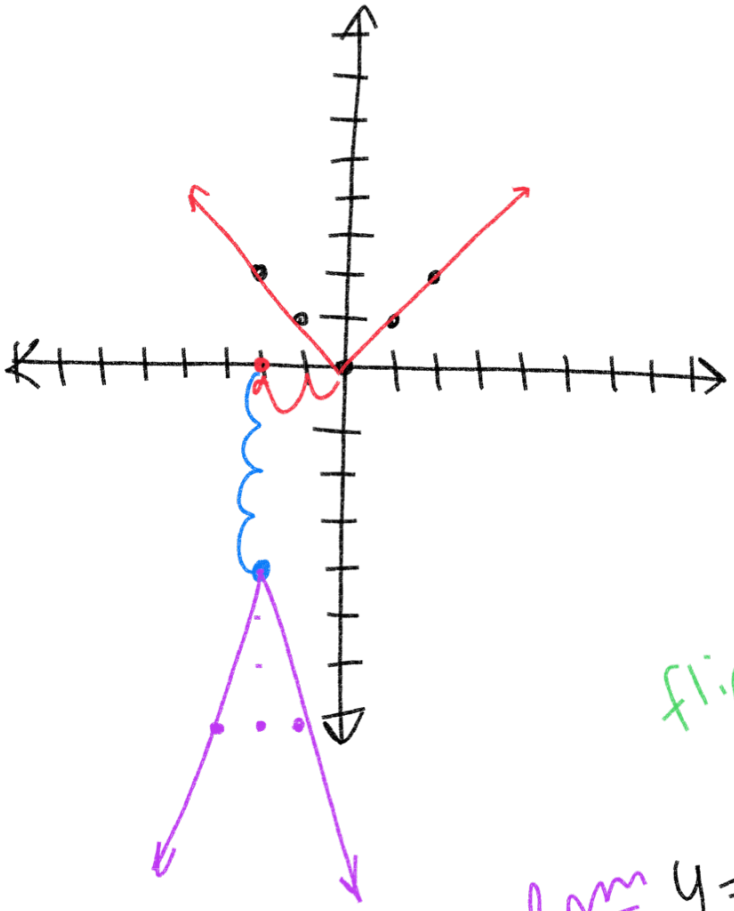
$y = \square|2(x-1)|+4$

flip up ⊕ / down ⊖

horizontal shift

vertical

up 4



$$y = -\left|\frac{3x}{3} + \frac{6}{3}\right| - 4$$

$$y = -\left|3(x+2)\right| - 4$$

$$y = \left|a(x-b)\right| + c$$

slope — horizontal shift — vertical shift

flip down

$$y = -\left|3(x+2)\right| - 4$$

3 down 1 over

2 Left

4 down