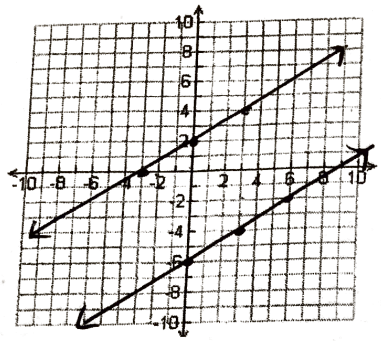
Parallel and Perpendicular Lines in the Coordinate Plane NOTES

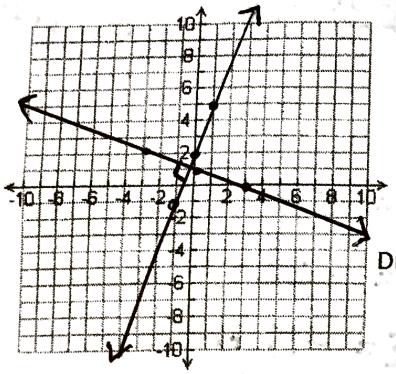


Parallel lines have Same slope.

Draw an example of parallel lines. Give an equation for each of your lines.

$y = \frac{2}{3}x - 6$

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



Perpendicular lines have opposite reciprocal slope.

What does this mean? opposite sign + flipped fraction

$\frac{3}{1} \rightarrow -\frac{1}{3}$ $\quad \frac{3}{4} \rightarrow -\frac{4}{3}$

*Note: The product of perpendicular line slopes is -1

Draw an example of perpendicular lines. Give an equation for each of your lines.

$y = 3x + 2$

$y = -\frac{1}{3}x + 1$

For each slope given, identify what slope the parallel and perpendicular line would have.

slope	parallel	perpendicular
$\frac{4}{3}$	$\frac{4}{3}$	$-\frac{3}{4}$
$-\frac{2}{5}$	$-\frac{2}{5}$	$\frac{5}{2}$
5	5	$-\frac{1}{5}$
-1	-1	1
0	0	undefined
$\frac{a}{b}$	$\frac{a}{b}$	$-\frac{b}{a}$

Are the following lines parallel perpendicular or neither? How do you know?

1. $y = 3x + 5$, $y = 3x + 1$

neither

2. $y = -\frac{2}{3}x + 5$, $y = \frac{3}{2}x - 8$

perpendicular

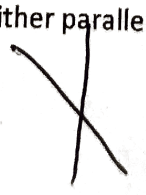
3. $y = -x + 1$, $y = x + 2$

perpendicular

4. $y = 5x$, $y = 4 + 5x$

parallel

What would lines that are neither parallel nor perpendicular look like?



Intersecting lines

Write the equation of a line that is parallel AND a line that is perpendicular to a given line through the given point.

1. $y = -2x - 5$, (-1, 4)

parallel
slope: -2 (-1,4)

$y = -2x + b$
$4 = -2(-1) + b$
$4 = 2 + b$
$2 = b$
$y = -2x + 2$

perpendicular
slope: $\frac{1}{2}$ point (-1,4)

$y = \frac{1}{2}x + b$
$4 = \frac{1}{2}(-1) + b$
$4 = -\frac{1}{2} + b$
$4.5 = b$
$y = \frac{1}{2}x + 4.5$

2. $y = 3x$ (3, 6)

parallel
slope: 3 (3,6)

$y = 3x + b$
$6 = 3(3) + b$
$6 = 9 + b$
$-3 = b$
$y = 3x - 3$

perpendicular
slope: $-\frac{1}{3}$ (3,6)

$y = -\frac{1}{3}x + b$
$6 = -\frac{1}{3}(3) + b$
$6 = -1 + b$
$7 = b$
$y = -\frac{1}{3}x + 7$

3. $y = \frac{3}{4}x - 2$, (0, 5) ~~parallel~~ perpendicular

$y = -\frac{4}{3}x + b$
$5 = -\frac{4}{3}(0) + b$
$5 = b$
$y = -\frac{4}{3}x + 5$

4. $y = -10x + 8$, $(\frac{1}{2}, \frac{1}{2})$ parallel

$y = -10x + b$
$\frac{1}{2} = -10(\frac{1}{2}) + b$
$\frac{1}{2} = -5 + b$
$5\frac{1}{2} = b$
$y = -10x + 5.5$

5. ~~$7y = 4x + 1$, (28, 2) perpendicular~~

6. ~~$6y + x = 120$, (18, 24) perpendicular~~