M10 - 8.1 - Number of Intersections System Notes

3 possible cases:

- one solution
- no solutions
- infinite number of solutions.

One Solution **Different slopes**

$y = x - 3$ $y = -x - 1$

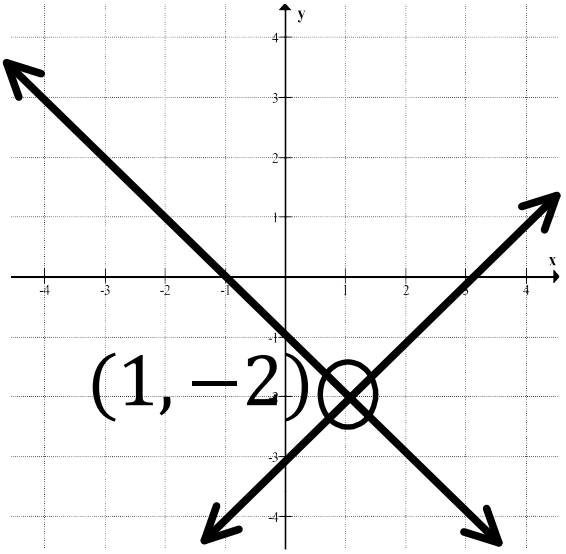
$m = 1$ $m = -1$ **Different Slopes**

$x - y - 3 = 0$
$+y \quad +y$
$x - 3 = y$

$y = x - 3$

Both to $y = mx + b$
Algebra
$+y$ to Both Sides

Mirror



No Solutions **Parallel Lines**

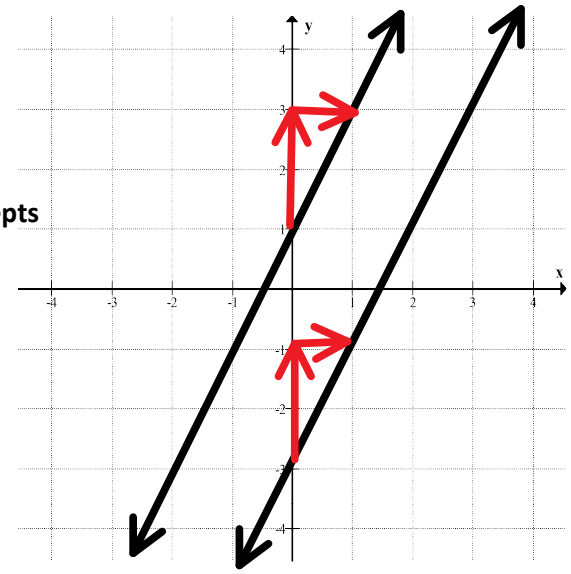
$y = 2x - 3$ $y = 2x + 1$

$m = 2$
$b = -3$

$m = 2$
$b = 1$

Same slope
Different y-intercepts

These Lines Never Intersect



Infinite Solutions **Same Line**

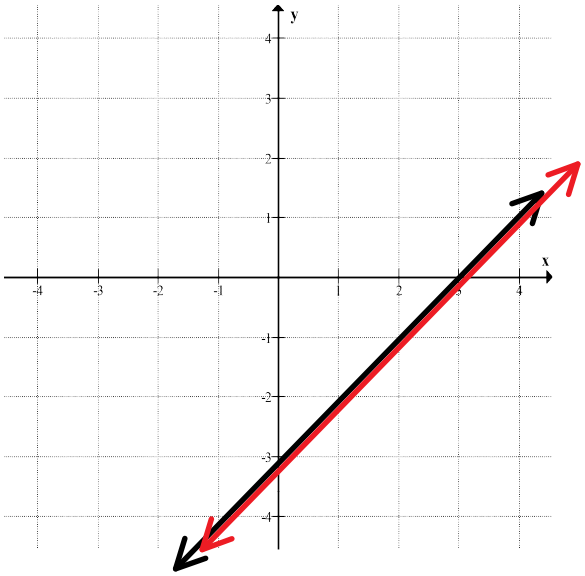
$y = x - 3$ $y = x - 3$

$m = 1$
$b = -3$

$m = 1$
$b = -3$

Same slope
Same y-intercept

These Lines are on Top of Each Other



M10 - 8.2 - Point on Line Notes

Is $(1,2)$ *a point on the line?*

$y = x + 1$ $\quad (1,2)$ $\quad (x, y)$

Identify x *and* y
Substitute for x *and* y
Solve

$y = x + 1$
$(2) = (1) + 1$
$2 = 2$ ✓

If it works it's a Point on the Line

Is $(1,2)$ *a point on the line?*

$y = -x + 3$ $\quad (1,2)$ $\quad (x, y)$

$y = -x + 3$
$(2) = -(1) + 3$
$2 = 2$ ✓

If it works it's a Point on the Line

x	y
1	2

$(1,2)$

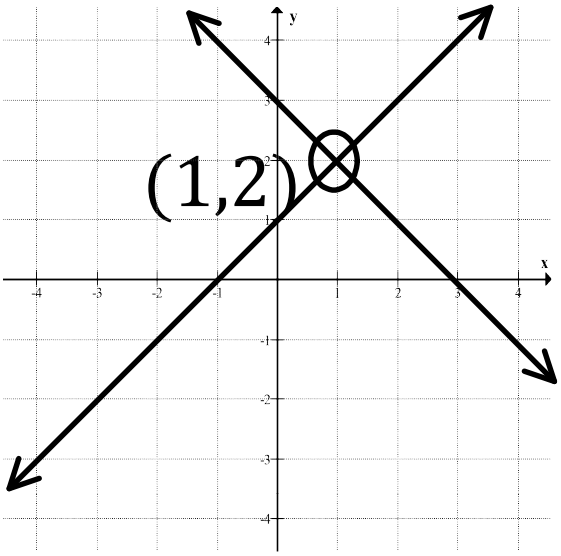
If it's is on both lines it must be the Intersection!

x	y
1	2

$(1,2)$

Graph both Lines:
Find Intersection

$y = mx + b$



$y = -x + 3$

$y = x + 1$

Both to $y = mx + b$
Algebra
$-x$ to Both Sides

$x + y = 3$
$-x \qquad -x$

$y = -x + 3$

Is $(1,3)$ *a point on the line?*

$y = x + 1$ $\quad (1,2)$ $\quad (x, y)$

Identify x *and* y
Substitute Point for x *and* y
Solve

$y = x + 1$
$(3) \neq (1) + 1$
$3 \neq 2$ ✗

If it doesn't work it's NOT a Point on the Line.

Therefore Not the intersection!