Final — Fri 19 Dec

S-101

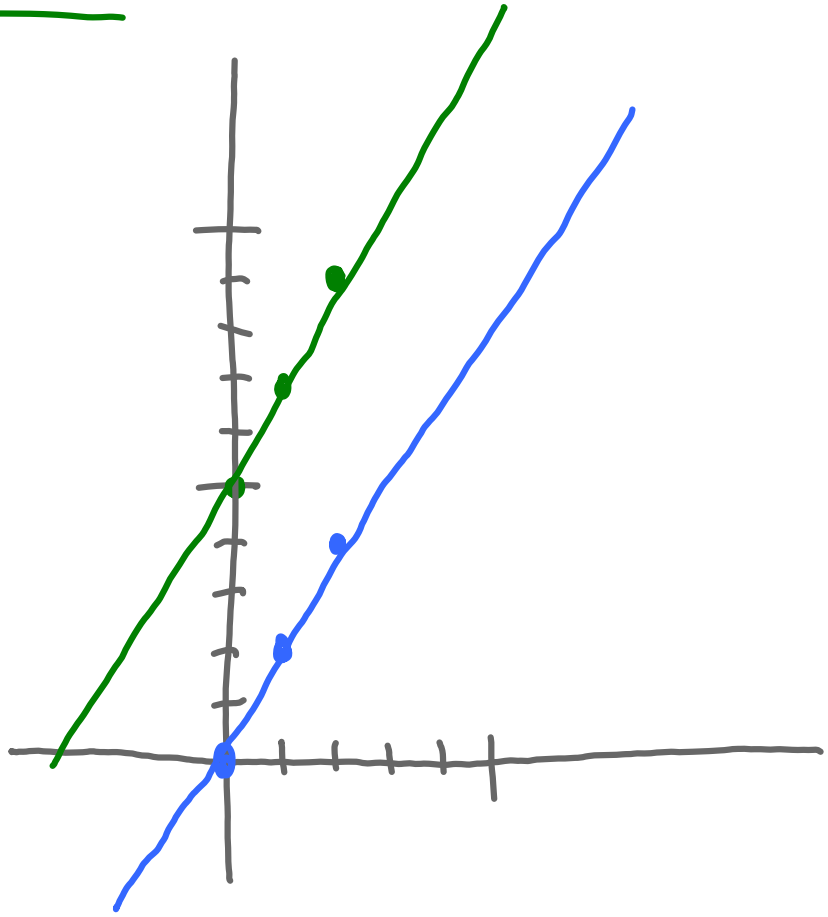
8-3

Graph both lines on the same graph.
Do you notice any differences and/or similarities?

42. $y = 2x$; $y = 2x + 5$

x	y
0	0
1	2
2	4

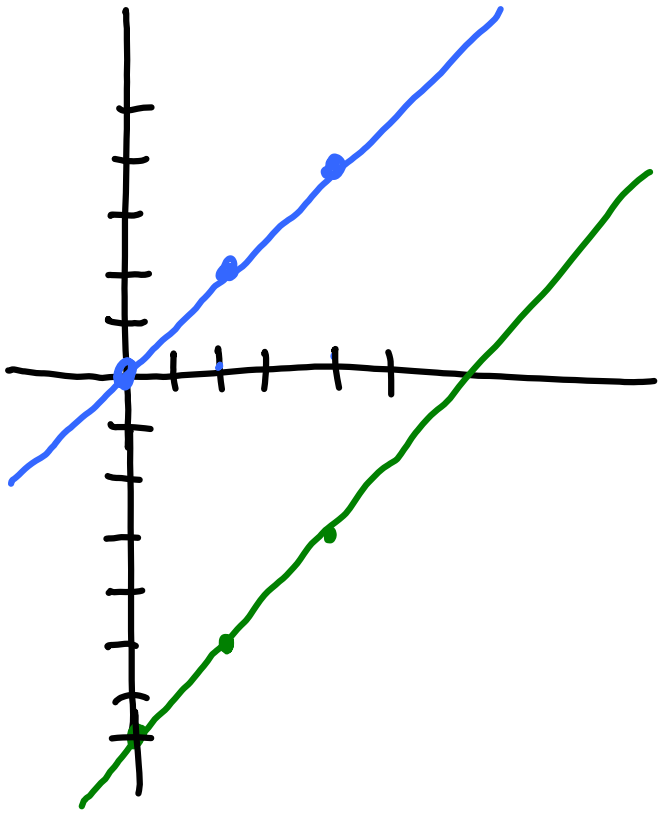
x	y
0	5
1	7
2	9



44. $y = x; y = x - 7$

x	y
0	0
2	2
4	4

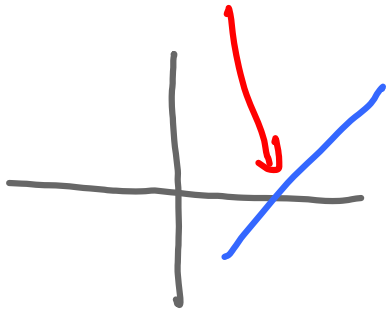
x	y
0	-7
2	-5
4	-3



3.3: Intercepts

Note: There x- & y- intercepts.

x-intercepts are point on the x-axis where the line crosses the x-axis

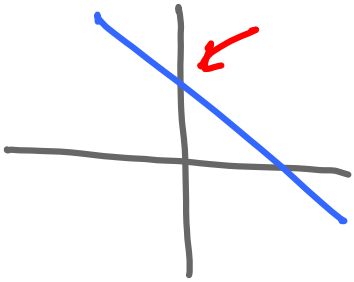


Note: all points on the x-axis have a y-coordinate equal to 0.

So to find the x-intercept just replace y with 0 & solve.

y-intercepts are where the line crosses the y-axis. Similar to above — all points on the y-axis have x-coordinate equal to 0.

So, to find the y-intercept merely replace x with 0 & solve.



EX: $2x + 3y = 6$

x-int ($y=0$) (3,0)

$2x + 3(0) = 6$

$2x = 6$

$x = 3$

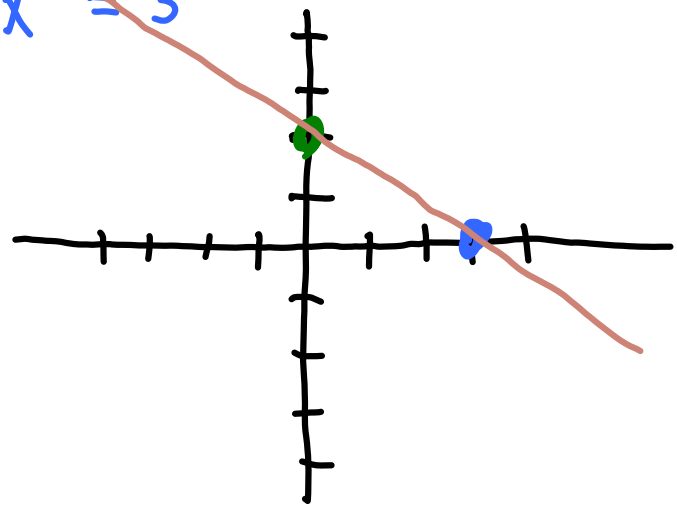
y-int ($x=0$) (0,2)

$2(0) + 3y = 6$

$3y = 6$

$y = 2$

x	y
3	0
0	2



Helpful Hint

If a graph crosses the x-axis at $(-3, 0)$ and the y-axis at $(0, 7)$, then

$\underbrace{(-3, 0)}_{x\text{-intercept}}$ $\underbrace{(0, 7)}_{y\text{-intercept}}$

Notice that for the y-intercept, the x-value is 0 and for the x-intercept, the y-value is 0.

Note: Sometimes in mathematics, you may see just the number 7 stated as the y-intercept, and -3 stated as the x-intercept.

Finding x- and y-intercepts

To find the x-intercept, let $y = 0$ and solve for x.

To find the y-intercept, let $x = 0$ and solve for y.

EX:

$$x + 3y = 9$$

x-int ($y=0$): $(9, 0)$

$x + 3(0) = 9$

$x = 9$

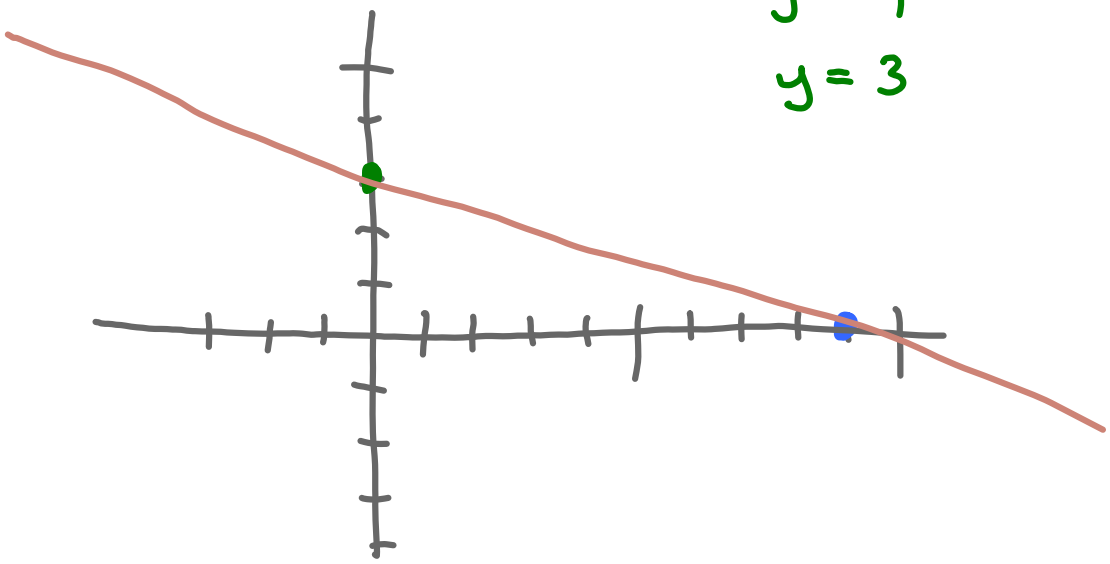
y-int ($x=0$): $(0, 3)$

$0 + 3y = 9$

$3y = 9$

$y = 3$

x	y
9	0
0	3



$$2x - 3y = 15$$

x-int ($y=0$): $(7\frac{1}{2}, 0)$

$2x - 3(0) = 15$

$2x = 15$

$x = \frac{15}{2}$ or $7\frac{1}{2}$

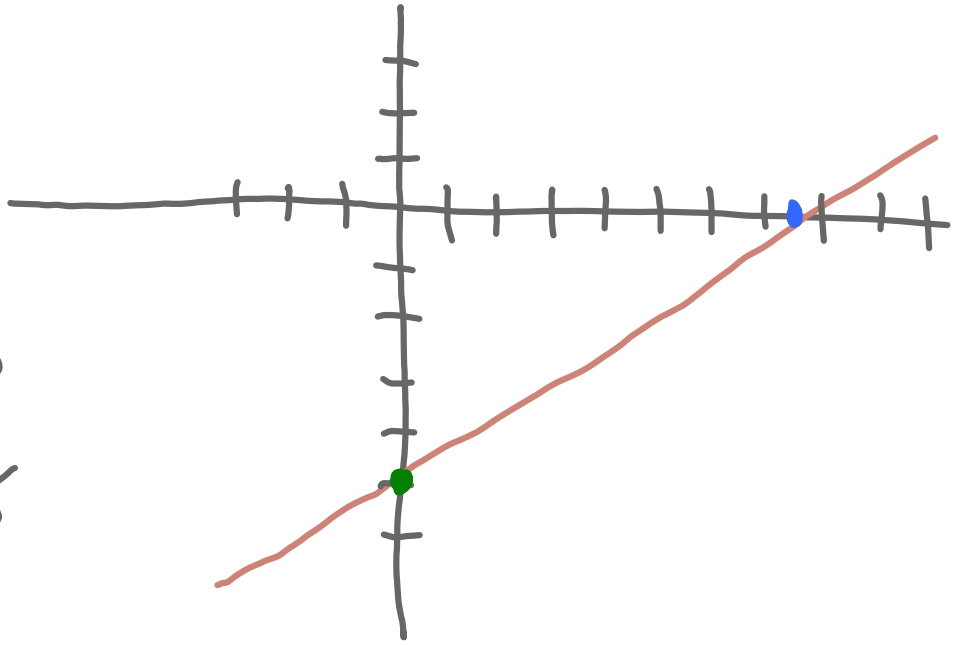
y-int ($x=0$): $(0, -5)$

$2(0) - 3y = 15$

$-3y = 15$

$y = -5$

x	y
$7\frac{1}{2}$	0
0	-5



$y = 4$

x-int ($y=0$)

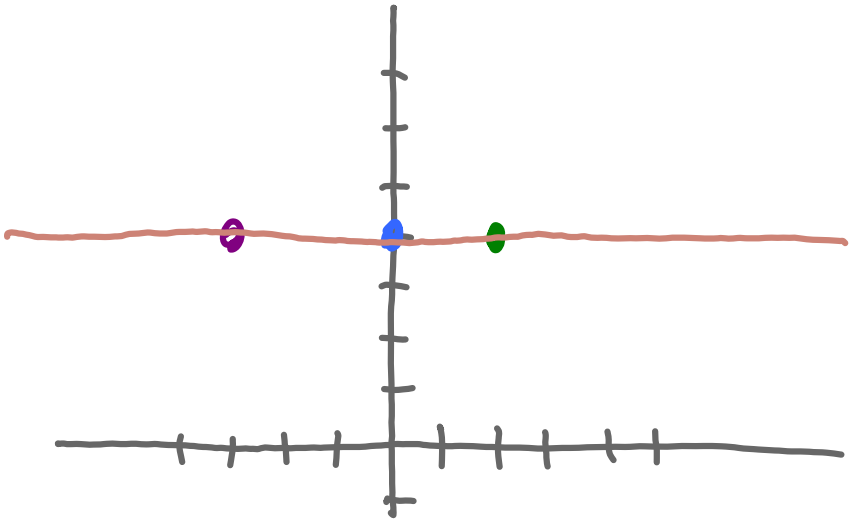
$0 = 4$

No x-int.

y-int ($x=0$)

$y = 4$

x	y
0	4
2	4
−3	4



$x = 2$

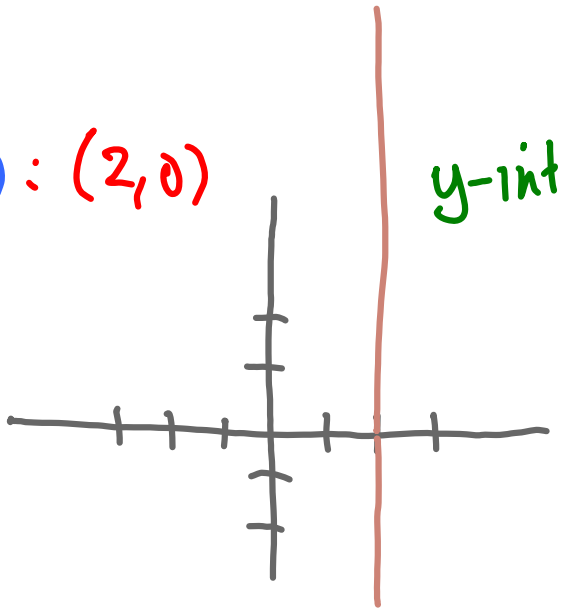
x-int ($y=0$): (2, 0)

$x = 2$

y-int ($x=0$) NO!

$0 = 2$

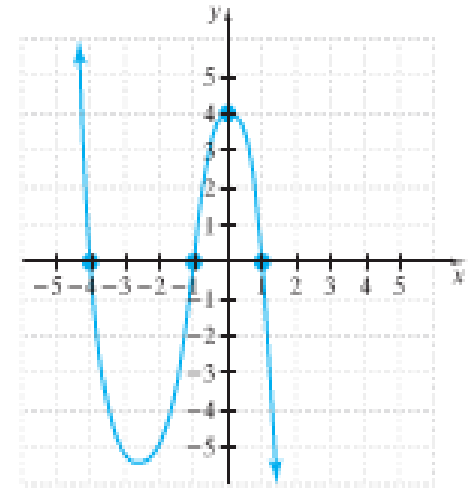
NO!



Ex: (p 200)

Find all intercepts:

6.



$y = x$

x-int ($y = 0$): $(0,0)$

$0 = x$

y-int ($x = 0$): $(0,0)$

$y = 0$

What are the greatest and least number of intercepts for a line?

x-intercepts?

y-intercepts?

Find the intercepts:

14. $x - y = -4$

20. $2x + 3y = 6$

24. $y = 2x + 10$

40. $-x + 9y = 10$

42. $x = -1\frac{3}{4}$

44. $y = 2\frac{1}{2}$

3.4: Slope & Rate of Change

Ex: $y = 2x + 3$

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

x	y
4	11
20	43
6	15
12	27

$$\text{slope} = \frac{11 - 43}{4 - 20}$$

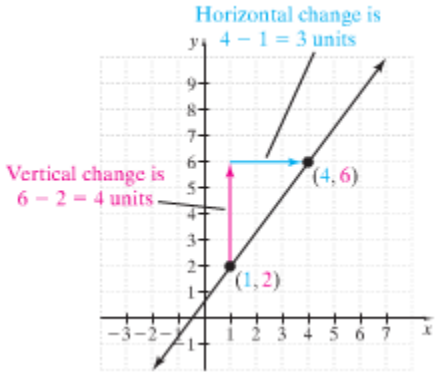
$$= \frac{-32}{-16}$$

$$= 2$$

$$\text{slope} = \frac{15 - 27}{6 - 12} = \frac{-12}{-6}$$

$$= 2$$

$$\text{slope} = \frac{\text{change in } y \text{ (vertical change)}}{\text{change in } x \text{ (horizontal change)}} = \frac{4}{3}$$



Slope of a Line

The slope m of the line containing the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}, \qquad \text{as long as } x_2 \neq x_1$$

Ex: (p 213)

Find the slope:

2. $(3, 1)$ and $(2, 6)$

4. $(6, -6)$ and $(6, 2)$

6. $(4, -3)$ and $(2, 2)$

8. $(0, 13)$ and $(-4, 13)$

26. $y = 4$

28. $x = 2$

30. $y = -11$

32. $x = 0$

34. $y = -2x + 6$

36. $y = -7.6x - 0.1$

38. $-5x + y = 10$

40. $3x - 5y = 1$

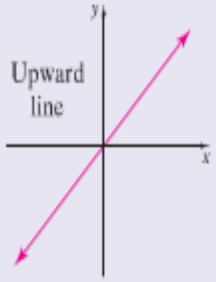
42. $y = -2$

44. $x = -4y$

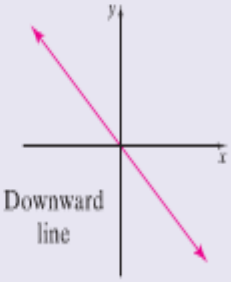
46. $x = 5$

Summary of Slope

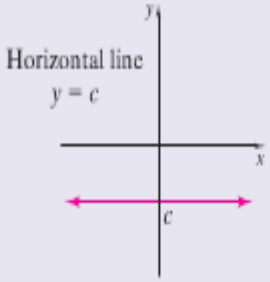
Slope m of the line through (x_1, y_1) and (x_2, y_2) is given by the equation $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.



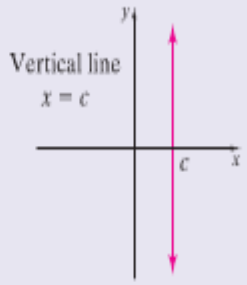
Positive slope: $m > 0$



Negative slope: $m < 0$



Zero slope: $m = 0$



Undefined slope or no slope

Slope-Intercept Form

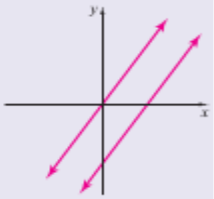
When a linear equation in two variables is written in slope-intercept form,

$$y = mx + b$$

m is the slope of the line and $(0, b)$ is the y-intercept of the line.

Parallel Lines

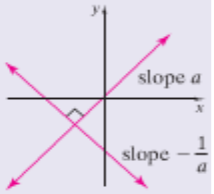
Nonvertical parallel lines have the same slope and different y-intercepts.



Perpendicular Lines

If the product of the slopes of two lines is -1, then the lines are perpendicular.

(Two nonvertical lines are perpendicular if the slopes of one is the negative reciprocal of the slope of the other.)



Ex: (p 214)

Are the following parallel, perpendicular, or neither.

52. $y = \frac{1}{5}x + 20$

$y = -\frac{1}{5}x$

54. $y = 4x - 2$

$4x + y = 5$

56. $-x + 2y = -2$

$2x = 4y + 3$

58. $10 + 3x = 5y$

$5x + 3y = 1$

3.5: Equations of Lines

Slope-Intercept Form

When a linear equation in two variables is written in **slope-intercept form,**

$$y = mx + b$$

(m: slope; $(0, b)$, y-intercept)

then m is the slope of the line and $(0, b)$ is the y-intercept of the line.

Forms of Linear Equations

$Ax + By = C$	**Standard form** of a linear equation. A and B are not both 0.
$y = mx + b$	**Slope-intercept form** of a linear equation. The slope is m and the y-intercept is $(0, b)$.
$y - y_1 = m(x - x_1)$	**Point-slope form** of a linear equation. The slope is m and (x_1, y_1) is a point on the line.
$y = c$	**Horizontal line** The slope is 0 and the y-intercept is $(0, c)$.
$x = c$	**Vertical line** The slope is undefined and the x-intercept is $(c, 0)$.

Parallel and Perpendicular Lines

Nonvertical parallel lines have the same slope.

The product of the slopes of two nonvertical perpendicular lines is -1.

Ex: (p 224)

Write an Equation of the Line Given the Info Below

2. $m = -3, b = -3$

6. $m = -\frac{4}{5}, b = 0$

12. $y = -4x - 1$

18. $-3x + y = 2$

20. $3x - 4y = 4$

24. $m = 4; \quad (1, 3)$

28. $m = \frac{2}{3}; \quad (-8, 9)$

32. $(6, 2)$ and $(8, 8)$

36. $(7, 10)$ and $(-1, -1)$

38. $(0, 0)$ and $\left(-\frac{1}{2}, \frac{1}{3}\right)$

40. Horizontal line through $(1, 4)$

42. Vertical line through $(-1, 3)$

46. Perpendicular to $y = 5$, through $(1, 2)$

48. Parallel to $y = -4$, through $(0, -3)$

52. With slope $\frac{5}{7}$, through $(0, -3)$

54. Through $(5, -6)$ and $(-6, 5)$

60. Slope -2; y-intercept $(0, -4)$

64. Through $(4, 7)$ and $(0, 0)$