### 11.1 Coordinates of points in a plane

| | |
|---|---|
| origin | The point (0,0) on a graph |
| x-axis | horizontal axis |
| y-axis | vertical axis |
| abscissa | x-coordinate in an orderd pair |
| ordinate | y-coordinate in an orderd pair |

(0,0)

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### 11.2 Point plotting

(-1,4)   (0,4)   (2,3)
(-2,0)   (0,0)   (6,0)
(3,-2)
(0,-3)

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### 11.3 Slope!

$m$   change in y   rise   $\Delta y$   $(y_2 - y_1)$
change in x   run   $\Delta x$   $(x_2 - x_1)$

$(x_2, y_2)$
$\Delta y$
$(x_1, y_1)$
$\Delta x$

UP

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(6,6)
$m = \dfrac{\Delta y}{\Delta x} = \dfrac{3}{5}$
(1,3)
$\Delta y = 6-3$   $m \dfrac{3}{5}$
$\Delta x = 6-1$

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$m = \dfrac{\Delta y}{\Delta x} = \dfrac{1-^-3}{6-1} = \dfrac{1+3}{6+1} = \dfrac{4}{7}$

(6,1)

(-1,-3)

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(0,4)
$m = \dfrac{-2-4}{5-0} = \dfrac{-6}{5}$
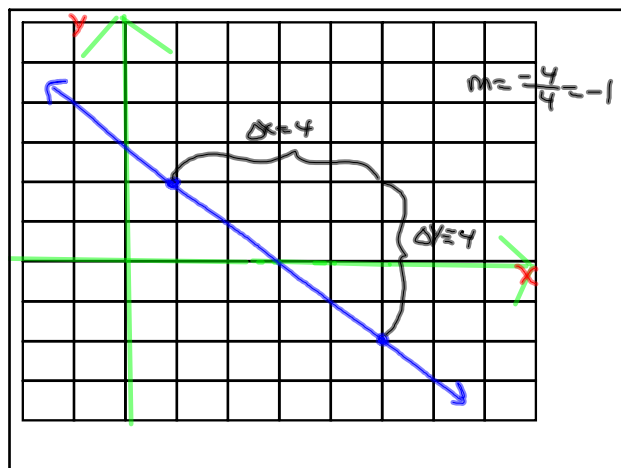
(5,-2)

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### 11.4 Slope of a line

Two lines with the same slope are parallel

The slope of a horizontal line is zero

$\frac{\Delta y}{\Delta x} = \frac{0}{\Delta x}$   $\frac{0}{\Delta x} = 0$

The slope of a vertical line is undefined

$\frac{\Delta y}{\Delta x} = \frac{\Delta y}{0}$
$\Delta x = 0$
$m = \frac{\Delta y}{0}$

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$m = \frac{-4}{4} = -1$

$\Delta x = 4$

$\Delta y = 4$

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### 11.5 equations of lines



(5,3)

(1,-4)
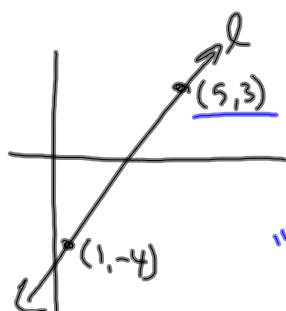
$y - y_1 = m(x - x_1)$

y minus the y-coordinate equals the slope times x minus the x coordinate.

$m = \frac{7}{4}$

$y - 3 = \frac{7}{4}(x - 5)$
"point-slope"

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$y - 3 = \frac{7}{4}(x - 5)$
"point-slope" form

$4y - 12 = 7(x - 5)$
$4y - 12 = 7x - 35$
$23 = 7x - 4y$
$\boxed{7x - 4y - 23 = 0}$  "standard" form

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$2x + y + 1 = 0$

is $(2, -5)$ on the line?

$2(2) + (-5) + 1 = 0$
$4 - 5 + 1 = 0$   yes! ☺
$0 = 0$

is $(3, 0)$?

$2(3) + 0 + 1 \neq 0$   no.
$7 \neq 0$

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$P(3,3)$  $Q(4,5)$

$m = \frac{5-3}{4-3} = 2$

$y - 3 = 2(x - 3)$       $y - 5 = 2(x - 4)$
$y - 3 = 2x - 6$         $y - 5 = 2x - 8$
$-3 = 2x - y - 6$        $-5 = 2x - y - 8$
$2x - y - 3 = 0$         $2x - y - 3 = 0$

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**11.6 Using equations of lines**

$$y = \frac{2}{5}x - \frac{3}{5}$$

$C(14, Y)$ is on this line

<u>find y</u>

$$y = \frac{2}{5}(14) - \frac{3}{5}$$

$$y = \frac{28}{5} - \frac{3}{5} = \frac{25}{5} = 5$$

$C(14, 5)$

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$$y = 2x - 3$$

| X | 2x-3 | y |
|---|------|-----|
| -1 | 2(-1)-3 | -5 |
| 0 | 2(0)-3 | -3 |
| 1 | 2(1)-3 | -1 |
| 2 | 2(2)-3 | 1 |
| 3 | 2(3)-3 | 3 |

$$\frac{\Delta y}{\Delta x} \quad \frac{2}{1}$$

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**11.7 Slope-intercept form of an equation of a line**

The y-intercept is the y-coordinate of the point where the line intersects the y-axis
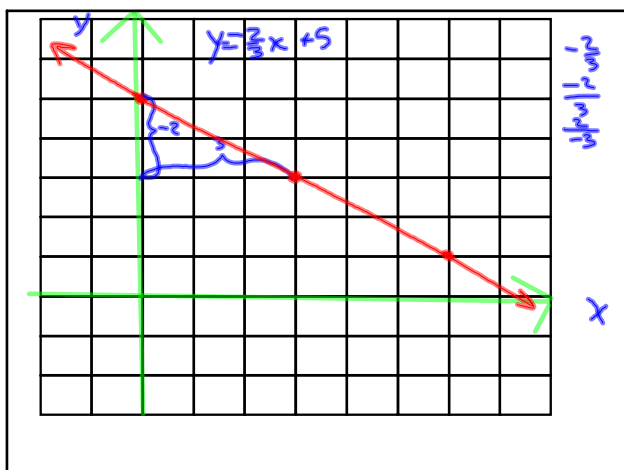
$$y = 2x + 3 \qquad m = 2$$

$$y = mx + b$$
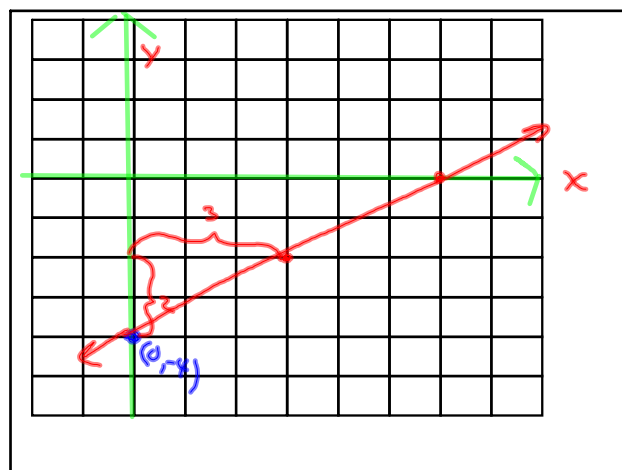
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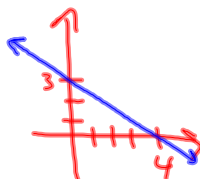
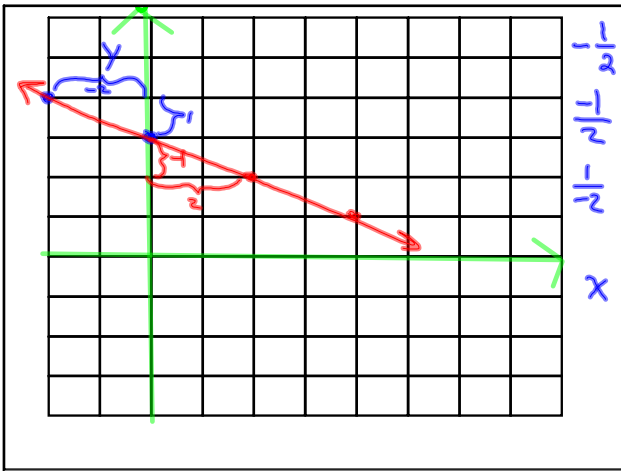b - y-intercept
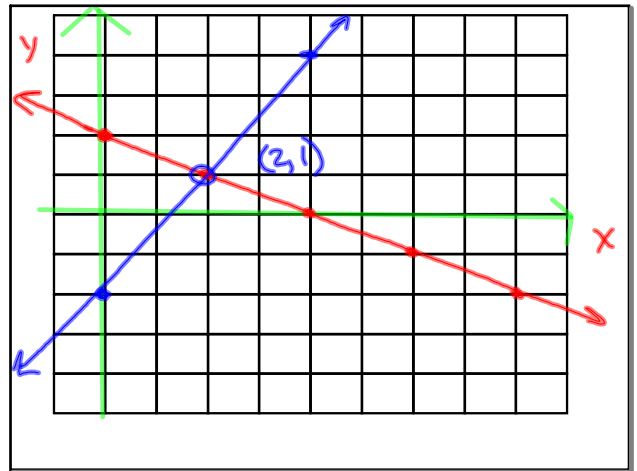m - slope

y = mx + b
    slope-intercept form

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$$y = \frac{2}{3}x + 5$$

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$(0, -4)$

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Jul 20-3:03 PM



Jul 20-3:06 PM

$y = \frac{1}{2}x + 2$

$1 = -\frac{1}{2}(2) + 2$

$1 = -1 + 2$

$1 = 1$ ✓

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

$1 = \frac{3}{2}(2) - 2$

$1 = 3 - 2$

$1 = 1$ ✓

$y = -\frac{1}{2}x + 2$

$2y = -x + 4$

$x + 2y = 4$

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### 11.8 Graphing nonvertical lines

$5x - 3y = 9$

$5x - 3y - 9 = 0$

standard form

$-3y = -5x + 9$

$y = \frac{5}{3}x - 3$    slope-intercept form

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$6y - 18 = 0$

$6y = 18$

$y = 3$

$y = 0x + 3$



$(0, 3)$
$(1, 3)$
$(-6, 3)$
$(2, 3)$

$y = 3$

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### 11.9 Graping vertical lines



$(6, google)$
$(6, 0)$
$(6, 8)$
$(6, 100)$
$(6, -3)$
$(6, 0.3)$

$x = 6$

$23 - x = 4$

$-x = -19$

$x = 19$

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**4**

11.10 Graphing inequalities

any line splits the coordinate plane into 2 "half-planes"

half plane

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

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

(5,4)

$0 \leq \frac{1}{3}(0) + 1$
$0 \leq 0 + 1$
$0 \leq 1$

$4 \leq \frac{1}{3}(5) + 1$
$4 \leq \frac{5}{3} + 1$
$4 \leq \frac{5}{3} + \frac{3}{3}$
$4 \leq \frac{8}{3}$
$\frac{12}{3} \leq \frac{8}{3}$
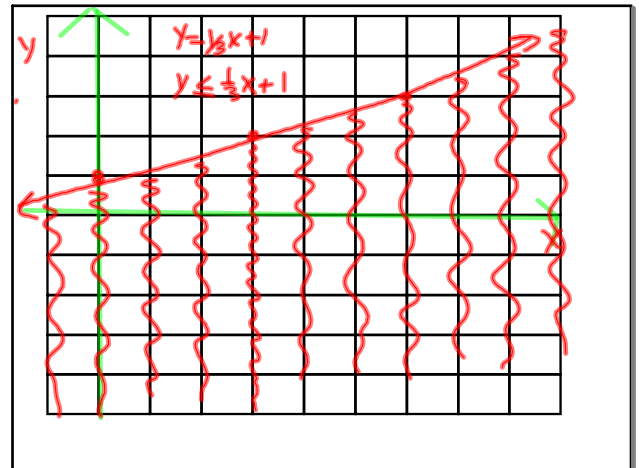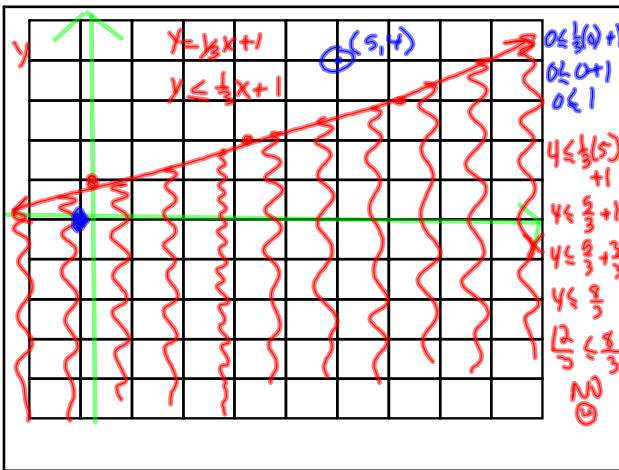
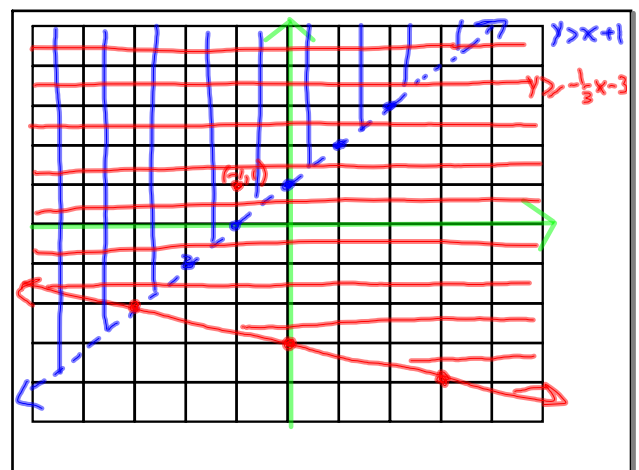Jul 21-1:52 PM
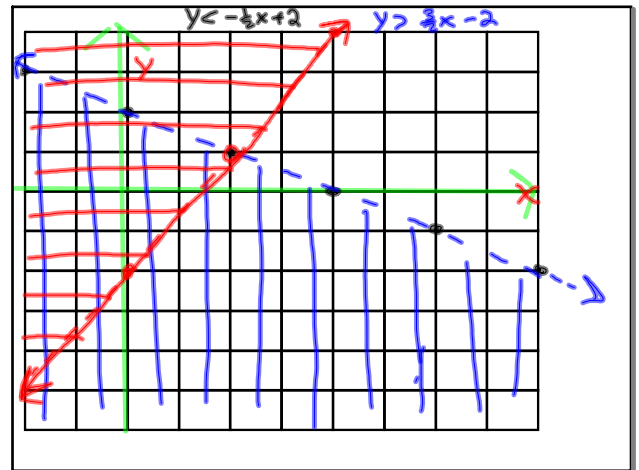


$y < -\frac{1}{2}x + 2$      $y > \frac{3}{2}x - 2$

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$y < -\frac{1}{2}x + 2$      $y \geq \frac{3}{2}x - 2$
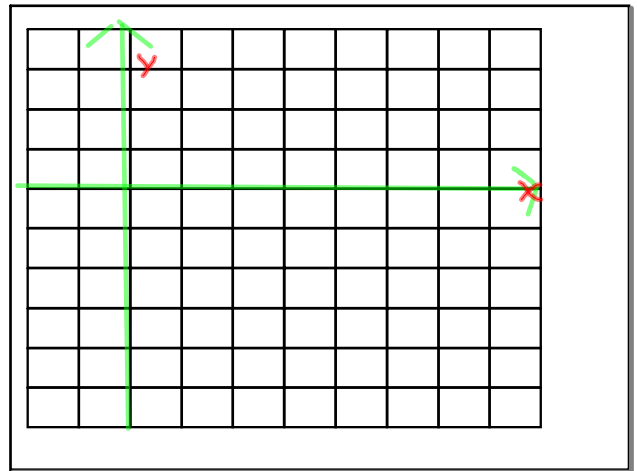$0 < -\frac{1}{2}(0) + 2$      $0 \geq \frac{3}{2}(0) - 2$
$0 < 2$          $0 \geq -2$

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

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$y > x + 1$

$1 > -1 + 1$

$1 > 0$

$y \geq -\frac{1}{3}x - 3$

$1 \geq -\frac{1}{3}(-1) - 3$

$1 \geq \frac{1}{3} - \frac{9}{3}$

$1 \geq -\frac{8}{3}$

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