6.4 Slope-Intercept form

$y = mx + b$

m: slope

b: vertical intercept (y-intercept)

Equation	slope	y-int
$y = \frac{2}{3}x + 5$	$\frac{2}{3}$	5
$y = -2x - 3$	-2	-3
$y = -\frac{3}{4}x + 2$	$-\frac{3}{4}$	2
$y = \frac{1}{2}x + 7$	$\frac{1}{2}$	7
$y = \frac{2}{3}x - 5$	$\frac{2}{3}$	-5
	m	b
$y = -3x + \frac{1}{4}$	-3	$\frac{1}{4}$

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Write the equation in $y=mx+b$ (m = slope, b = y-int) form given:

1) slope and the y-intercept

Ex: slope is $-\frac{1}{3}$ and y-intercept is 7

Answer: $y=-\frac{1}{3}x+7$

2) slope and a point

Ex: slope is 2 and passes through $(1,5)$ (x, y)

- using the slope only we get the partial equation $y=2x+b$
- sub in 1 for x and 5 for y

$5=2(1)+b$

$5=2+b$

$3=b$

Now we can complete our equation

$y=2x+3$

Ex② Slope is $\frac{3}{2}$ and point is $(-4,3)$

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

$3=\frac{3}{2}(-4)+b$

$3=-\frac{12}{2}+b$

$3=-6+b$ (+6 +6)

$9=b$

$y=\frac{3}{2}x+9$

Ex③ Slope is $-\frac{1}{2}$ and point is $(3,2)$

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

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

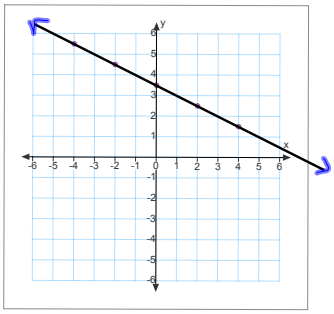
$2=-\frac{3}{2}+b$ (+3/2 +3/2)

$\frac{2}{2}\cdot\frac{2}{1}+\frac{3}{2}=b$

$\frac{4}{2}+\frac{3}{2}=b$

$\frac{7}{2}=b$

$y=-\frac{1}{2}x+\frac{7}{2}$



$\frac{7}{2}=3.5$

1) slope and the y-intercept
2) slope and a point
3) two points

Ex① line passes through $(\overset{x_1}{-2}, \overset{y_1}{3})$ and $(\overset{x_2}{5}, \overset{y_2}{17})$

need to calculate slope using $\frac{y_2-y_1}{x_2-x_1}$

$$m = \frac{17-3}{5--2} = \frac{14}{7} = 2$$

using $m=2$ we get $y = 2x + b$

now sub in 5 for x and 17 for y to get b

$$17 = 2(5) + b$$
$$17 = 10 + b$$
$$7 = b$$

So equation is $y = 2x + 7$

Ex②: Given points $(\overset{x_1}{-1}, \overset{y_1}{-3})$ and $(\overset{x_2}{5}, \overset{y_2}{-2})$

$$m = \frac{y_2-y_1}{x_2-x_1} = \frac{-2--3}{5--1} = \frac{1}{6}$$

$y = \frac{1}{6}x + b$

sub in $(5,-2)$

$-2 = \frac{1}{6}(5) + b$

$-2 = \frac{5}{6} + b$

$(6)\ -\frac{2}{1} - \frac{5}{6} = b$ (6)

$-\frac{12}{6} - \frac{5}{6} = b$

$-\frac{17}{6} = b$

$$y = \frac{1}{6}x - \frac{17}{6}$$

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Slope-intercept form : $y = mx + b$

slope-point form: $(y - y_1) = m(x - x_1)$

General form : $Ax + By + C = 0$

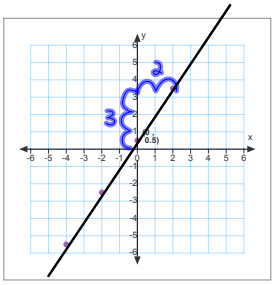
Ex: Change $3x - 2y + 1 = 0$ to slope-intercept form:

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

$3x - 2y + 1 = 0$

$\frac{-2y}{-2} = \frac{-3x}{-2} - \frac{1}{-2}$

$y = \frac{3}{2}x + \frac{1}{2}$



Ex② change $y = -\frac{1}{3}x + 5$ to general form

$y = -\frac{1}{3}x + 5$

$3\left[\frac{1}{3}x + y - 5 = 0\right]$

$x + 3y - 15 = 0$ (G.F.)

Ex③ change $y - 2 = \frac{3}{4}(x + 1)$ to General form

$y - 2 = \frac{3}{4}(x + 1)$

$y - 2 = \frac{3}{4}x + \frac{3}{4}$

$-4\left[-\frac{3}{4}x + y - 2 - \frac{3}{4} = 0\right]$

$3x - 4y + 8 + 3 = 0$

$3x - 4y + 11 = 0$

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page 372 # 4, 5, 6, 8, 9, 12, 14

page 362 # 4, 5, 17, 18-21

page 388 (Review) #1-9, 11-13, 16-19 21, 22, 25, 26

page 391 Practice Test.

Ex: Change $y = \frac{2}{3}x + \frac{1}{5}$ to G.F.

$15\left(-\frac{2}{3}x + y - \frac{1}{5} = 0\right)$

$-1(-10x + 15y - 3 = 0)$

$10x - 15y + 3 = 0$

Slope $= \frac{-A}{B}$

$\frac{+10}{+15} = \frac{2}{3}$

Ex: Change $(y+3) = 2(x-5)$ to slope intercept form. $(y = mx + b)$ $m = 2$ $(5, -3)$

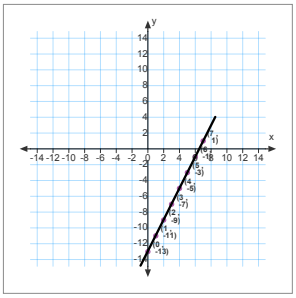
$y + 3 = 2(x-5)$

$y + 3 = 2x - 10$

$-3 \quad -3$

$y = 2x - 10 - 3$

$y = 2x - 13$



Ex: Change $(y-1) = \frac{1}{2}(x+6)$ to $y = mx + b$

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

$y = \frac{1}{2}x + 3 + 1$

$y = \frac{1}{2}x + 4$

Ex: Write the equation of a line which has the same slope as $y = \frac{2}{3}x - 5$ and the same y-intercept as $(y-1) = \frac{1}{2}(x+6)$

Solution: Same slope as $y = \frac{2}{3}x - 5$

$\therefore m = \frac{2}{3}$

Same y-intercept as $(y-1) = \frac{1}{2}(x+6)$

$\Rightarrow$ change to $y = mx + b$ form

$y = \frac{1}{2}x + 4$ from previous Ex

$\therefore b = 4$

Thus, equation is $y = \frac{2}{3}x + 4$

now, write this equation in general form.

$-3\left[-\frac{2}{3}x + y - 4 = 0\right]$

$2x - 3y + 12 = 0$

Ex: write the equation of the line which is perpendicular (slope) to $(y+3)=-\frac{4}{3}(x+1)$ and which has the same y-intercept as $2x-3y-6=0$

Solution: $\perp$ to $(y+3)=-\frac{4}{3}(x+1)$

slope of this line is $-\frac{4}{3}$

so $\perp$ slope is $\frac{3}{4}$ our slope

x	y
0	

$\Rightarrow$ same y-int as $2x-3y-6=0$

get y-int, let $x=0$ (all pts on y-axi

$2(0)-3y-6=0$

$-3y-6=0$

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

$y=-2=b$

$2x-3y-6=0$

$-3y=-2x+6$

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

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

slope $=\frac{3}{4}$ $b=-2$

eq'n is $y=\frac{3}{4}x-2$

Ex: Graph the line $2x + 3y - 6 = 0$

Get y-int: make $x = 0$

$2(0) + 3y - 6 = 0$

$3y - 6 = 0$

$\frac{3y}{3} = \frac{6}{3}$

$y = 2$

$(0, 2)$

slope

$m = -\frac{A}{B} = -\frac{2}{3}$

Get x-intercept: make $y = 0$

$Ax + By + C = 0$

$2x + 3y - 6 = 0$

$2x + 3(0) - 6 = 0$

$2x - 6 = 0$

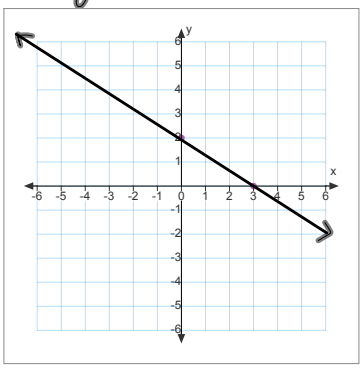
$\frac{2x}{2} = \frac{6}{2}$

$x = 3$

$(3, 0)$

$m = -\frac{A}{B}$

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



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

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

$2x - 5y - 20 = 0$

y-int: $x = 0$

$2(0) - 5y - 20 = 0$

$-5y - 20 = 0$

$\frac{-5y}{-5} = \frac{20}{-5}$

$y = -4$

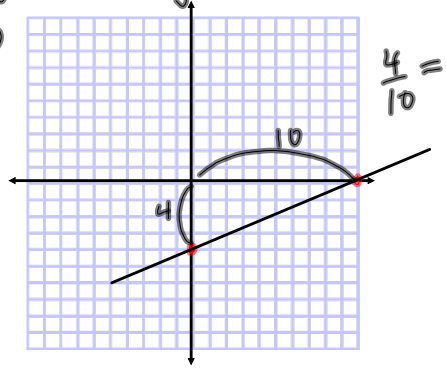
x-int: $y = 0$

$2x - 5(0) - 20 = 0$

$2x - 20 = 0$

$2x = 20$

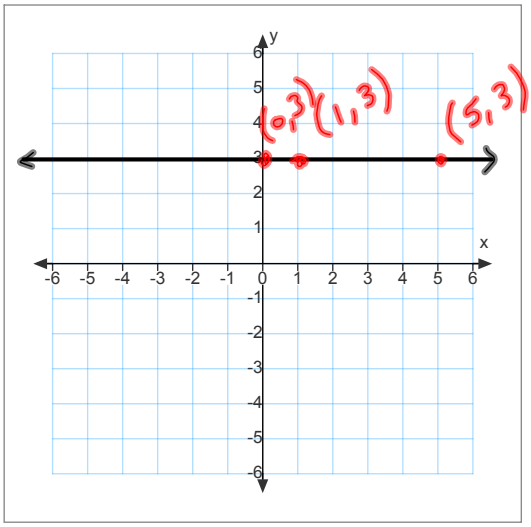
$x = 10$



$\frac{4}{10} = \frac{2}{5}$

Ex: write the equation of the given line.

(a)



$b = 3$

$m = 0$

$y - 3 = 0(x - 5)$

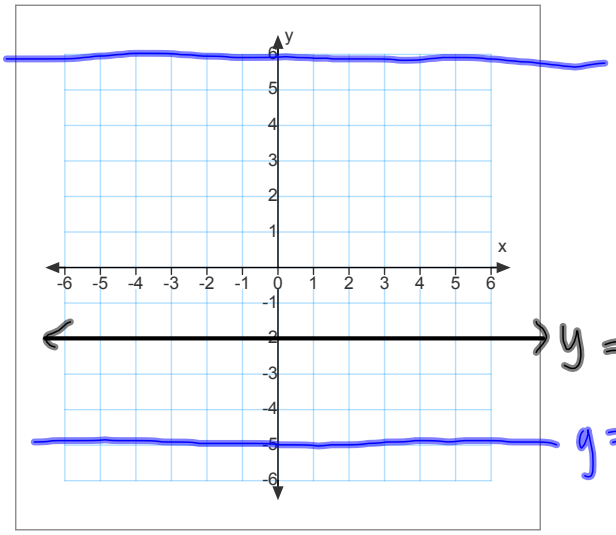
$y - 3 = 0$

$y = 3$

$y = 0x + 3$

$y = 3$

(b)

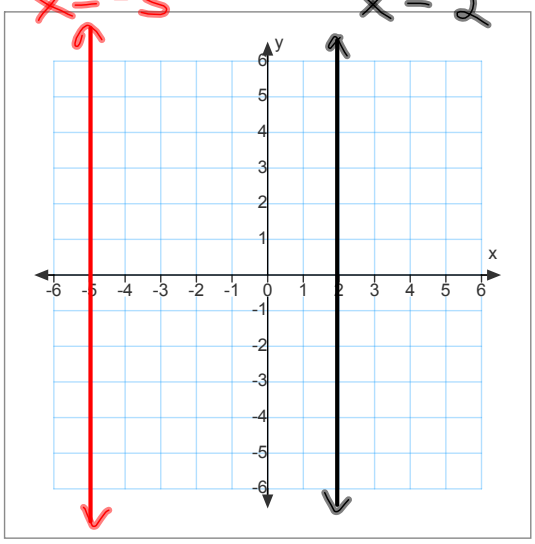


$y = 6$

$y = -2$

$y = -5$

(c)



$x = -5$

$x = 2$