Test on April 5th

Math 9 – Analytic Geometry

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Exam is Wednesday, April 18.

Lesson #3: Standard Form – Notes

Date: March 22, 2018

Today we will explore the second equation of a line form, called the Standard Form. Without further adieu, here it is: $Ax + By + C = 0$.

- x and y are coordinates, (x, y)
- A, B, and C are integers, meaning no decimals or fractions
  - Ax must be positive.

Examples:

$2x - 15y + 8 = 0$ or $8x + y - 2 = 0$

Standard Form can also be written as $Ax + By = C$, but then this is called Pseudo-Standard From. We will mostly stick to the true Standard From.

If x is negative, move it
If x is positive, move the y.

Example 1: Convert to Standard Form:

a) $y = \boxed{-5x + 4}$

$+5x \quad -4 \qquad +5x \quad -4$

$5x + y - 4 = 0$

b) $y = \frac{3}{4}x - 7$

$-y$

$4\left(0 = \frac{3}{4}x - y - 7\right)$

$0 = 3x - 4y - 28$

c) $y = \boxed{\frac{-2}{5}x + \frac{4}{3}}$

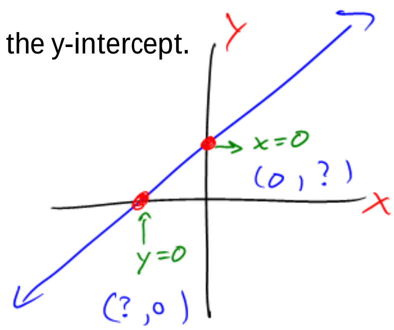
$\left(\frac{2}{5}x + y - \frac{4}{3} = 0\right)15$

$6x + 15y - 20 = 0$

Standard Form really finds its usefulness when you need to find the x-intercept and the y-intercept.

Recall: x-intercept is where the line crosses the x-axis

y-intercept is where the line crosses the y-axis



At the x-intercept, y= 0. At the y-intercept, x= 0. This is true ALWAYS.

Example 2: Calculate the x-intercept and the y-intercept. Then plot them and draw a line.

a) $2x - 3y + 12 = 0$

x-int, $y = 0$

$2x - \cancel{3(0)} + 12 = 0$

$\frac{2x}{2} = \frac{-12}{2}$

$x = -6$

$\therefore (-6, 0)$ x, y

y-int, $x = 0$

$\cancel{2(0)} - 3y + 12 = 0$

$\frac{-3y}{-3} = \frac{-12}{-3}$

$y = 4$

$\therefore (0, 4)$

b) $5x - 6y - 15 = 0$

x-int, $y = 0$

$5x - \cancel{6(0)} - 15 = 0$

$\frac{5x}{5} = \frac{15}{5}$

$x = 3$

$\therefore (3, 0)$

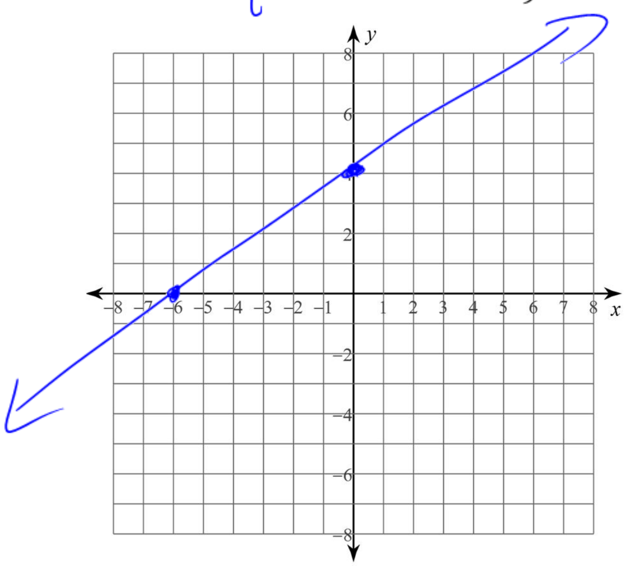
y-int, $x = 0$

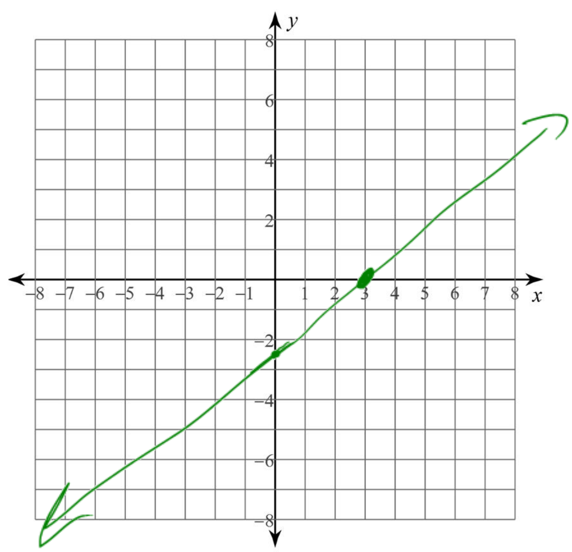
$\cancel{5(0)} - 6y - 15 = 0$

$\frac{-6y}{-6} = \frac{15}{-6}$

$y = \frac{-5}{2} = -2.5$

$\therefore (0, -2.5)$





Just like we did with the Slope Intercept Form ($y = mx + b$), we learned how to convert to it and how to access some properties to graph. The last thing we need to learn, then, is how to create the Standard Form equation from a graph or from information. This process is a little more tricky, and to help, we need to employ another equation called the *Point Slope Form* is $y - y_1 = m(x - x_1)$ where m is slope and (x_1, y_1) is the given point. This form comes from the slope formula.

Example 3: Create the Standard form given the following information.

a) $m = 4$ and $(3, 7)$ (x_1, y_1)

$y - y_1 = m(x - x_1)$

$y - 7 = 4(x - 3)$

$-y \; +7 \qquad -y \; +7$

$\boxed{y - 7} = 4x - 12$

$4x - y - 5 = 0$

$4(3) - 7 - 5$

$12 - 7 - 5$

$5 - 5$

0

b) $m=\frac{-3}{5}$ and $(\overset{x_1}{10},\overset{y_1}{4})$

$$y-y_1=m(x-x_1)$$

$$(y-4)=\frac{-3}{5}(x-10)$$

$$\overset{+3x\ \ -30}{5y-20}=\boxed{-3x+30}\quad {+3x}\ {-30}$$

$$3x+5y-50=0$$

c) $m=\frac{3}{2}$ and $(5,-8)$

$$y-y_1=m(x-x_1)$$

$$(y+8)=\frac{3}{2}(x-5)$$

$$\boxed{2y+16}=3x-15\quad -2y\ -16$$

$$3x-2y-31=0$$

d) $\overset{1\text{'s}}{(4,10)}$ and $\overset{2\text{'s}}{(8,-12)}$

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{-12-10}{8-4}=\frac{-22}{4}=\frac{-11}{2}$$

$$y-y_1=m(x-x_1)$$

$$(y-10)=\frac{-11}{2}(x-4)$$

$$+11x\ -44$$

$$2y-20=\boxed{-11x+44}$$

$$11x+2y-64=0$$

$$2y\overset{+20}{-20}=-11x\overset{+20}{+44}$$

$$\frac{2y}{2}=\frac{-11x}{2}+\frac{64}{2}$$

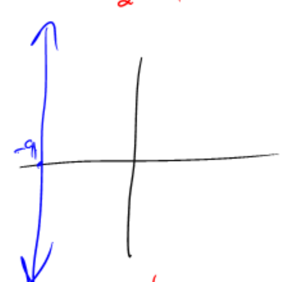
$$y=\frac{-11}{2}x+32$$

Convert to
$y=mx+b$

e) $(-9,8)$ and $\overset{2\text{'s}}{(-9,23)}$

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{23-8}{-9-(-9)}=\frac{15}{0}$$

$=$ undefined



The equation is $x=-9$

$$\boxed{x+9=0}$$

vertical line in standard form.

$8 \boxed{-4(-3)}$

$8 + 12$

$20.$

BEDMAS -4 ✓✓

error

20 ✓✓

1

Both Standard and $y=mx+b$: $(-51, 83)$ and $(25, -202)$

① Slope

② Use $y-y_1 = m(x-x_1)$

① $m = \frac{y_2-y_1}{x_2-x_1} = \frac{-202-83}{25-(-51)} = \frac{-285 \div 19}{76 \div 19}$

$m = \frac{-15}{4}$

$y - y_1 = m(x - x_1)$

$(y - 83) = \frac{-15}{4}(x + 51)$

$4y - 332 = -15x - 765$

Standard Form

$+15x \quad +765$

$4y - 332 = -15x - 765$

$15x + 4y + 433 = 0$

$y = mx + b$

$+332 \qquad +332$

$4y - 332 = -15x - 765$

$\frac{4y}{4} = \frac{-15x}{4} - \frac{433}{4}$

$y = \frac{-15}{4}x - \frac{433}{4}$