5.1 Linear Inequalities

Linear Equations/Inequalities All variables have power of 1.

Ex Linear Inequalities

$2x + 8y \geq 89$

$3x - 2y \geq 8$

$3x - 2y + 4z \leq 0$

Ex Non-Linear

$2x^3 \leq x^3 + y$

$x^2 + y^2 \leq 19z$

Solving Linear Inequalities:

↳ Put inequality in slope-intercept form

$y \leq mx + b$ (shade below line)

$y \geq mx + b$ (shade above line)

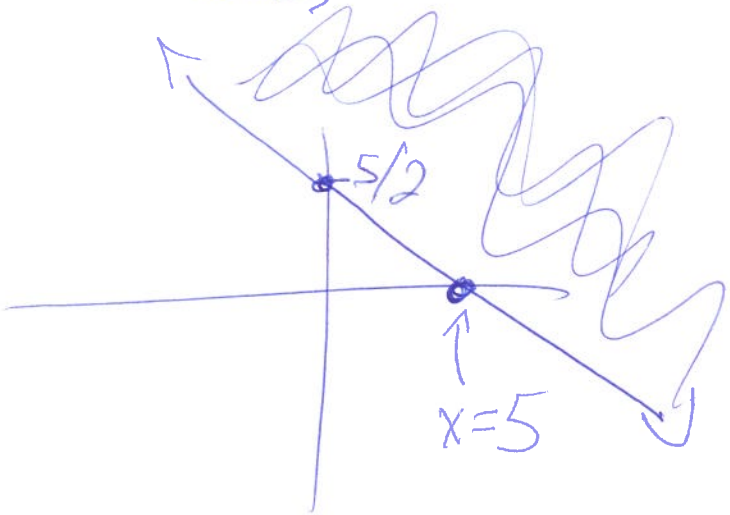
Ex $x + 2y \geq 5$

$2y \geq -x + 5$

$y \geq \frac{-1}{2}x + \frac{5}{2}$

$0 = \frac{-1}{2}x + \frac{5}{2}$

$\frac{1}{2}x = \frac{5}{2} \Rightarrow x = 5$



Ex $3x - 2y \leq 6$

Graph solution set.

$3x - 2y \leq 6$

$3x - 6 \leq 2y$

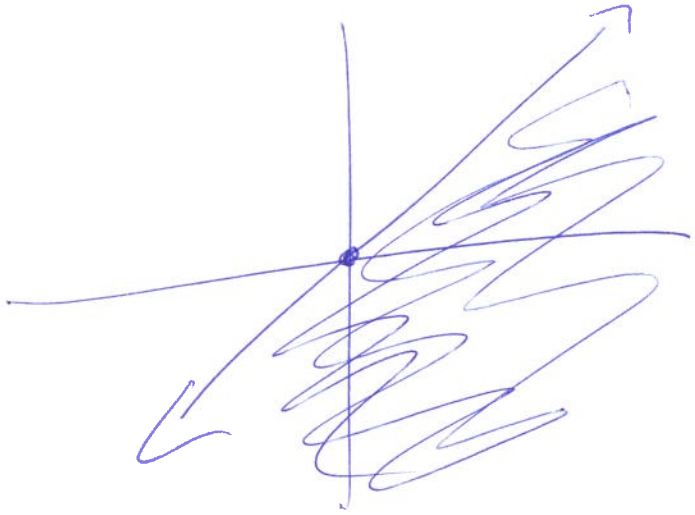
$2y \geq 3x - 6$

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

Ex $x \geq 3y$

$3y \leq x$

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



Systems of Linear Inequalities

Ex $2x - 5y \leq 10$
$x + 2y \leq 8$

Any solution **must** satisfy **both** inequalities.

$2x - 5y \leq 10$

$2x - 10 \leq 5y$

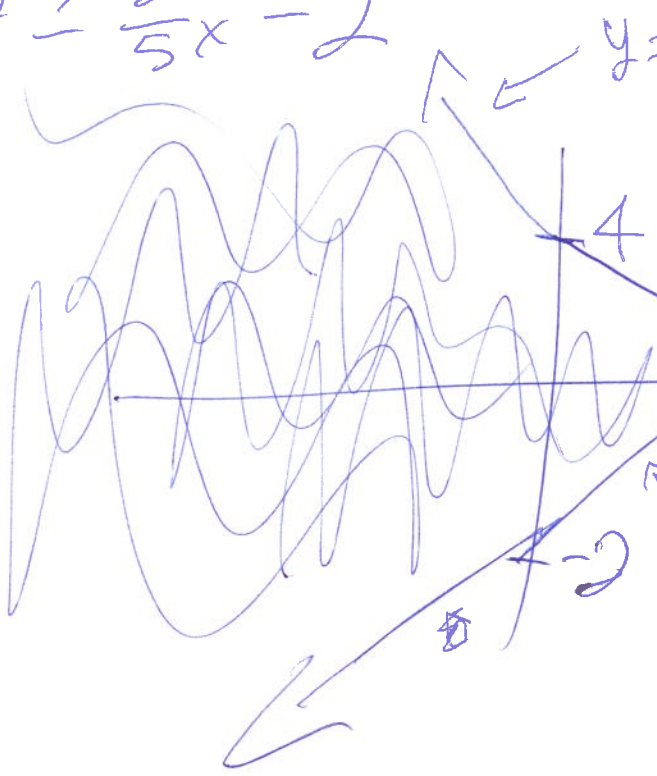
$5y \geq 2x - 10$

$y \geq \frac{2}{5}x - 2$

$x + 2y \leq 8$

$2y \leq -x + 8$

$y \leq \frac{-1}{2}x + 4$



Set $\frac{2}{5}x - 2 = \frac{-1}{2}x + 4$

$\frac{4}{10}x - 2 = \frac{-5}{10}x + 4$

$\frac{9}{10}x = 6$

$x = 6 \cdot \frac{10}{9} = \frac{60}{9}$

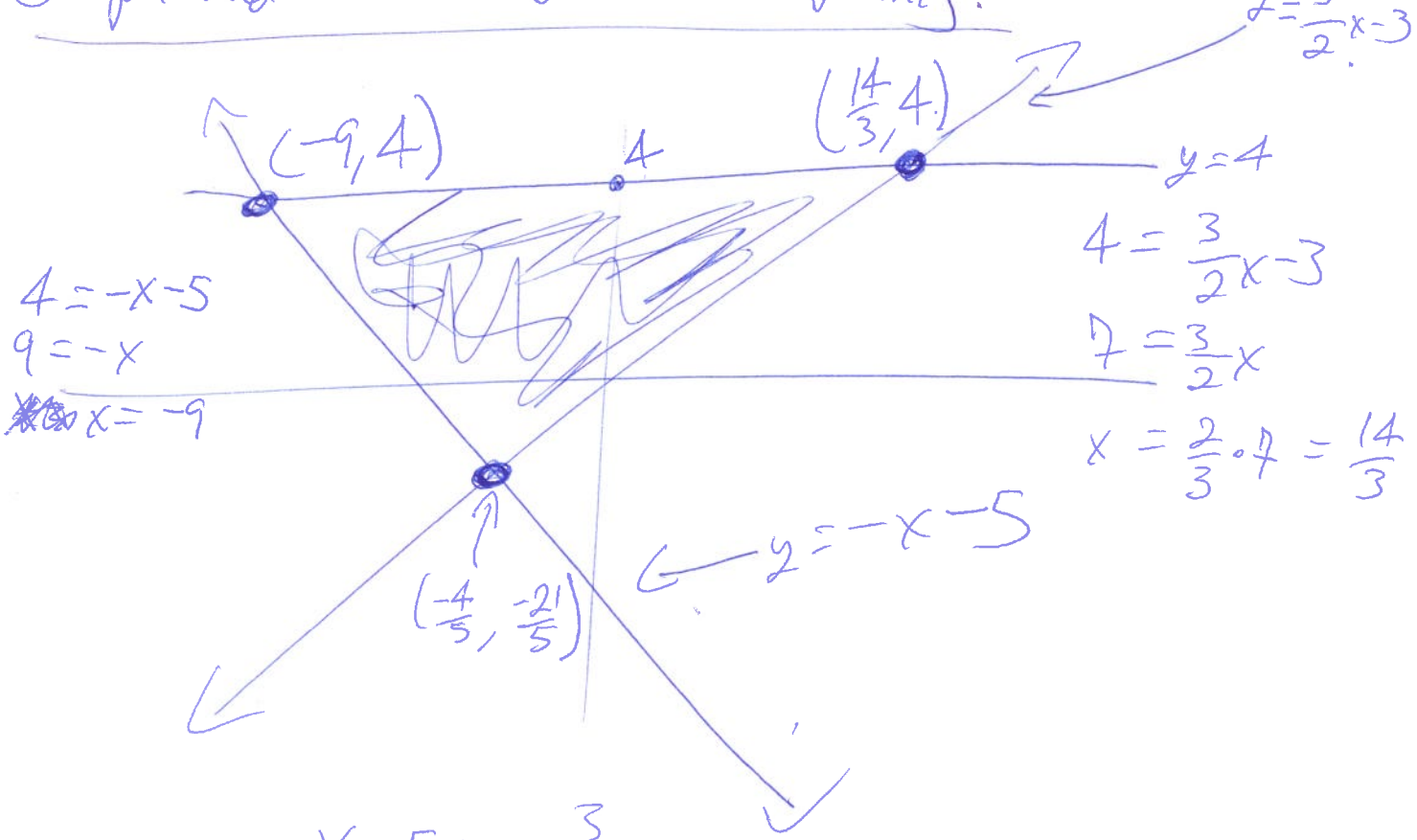
$y = \frac{-1}{2}\left(\frac{60}{9}\right) + 4$

Ex $3x - 2y \leq 6$

$x + y \geq -5$

$y \leq 4$

Graph and identify corner points.



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

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

$x = \frac{-4}{5}$

$y = -\left(\frac{-4}{5}\right) - 5$

$= \frac{4}{5} - \frac{25}{5} = \frac{-21}{5}$