5.1 Systems of Linear Inequalities

Linear Inequalities / Equations 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

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

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

Solve Linear Inequalities

↳ $\geq$ Shade above line

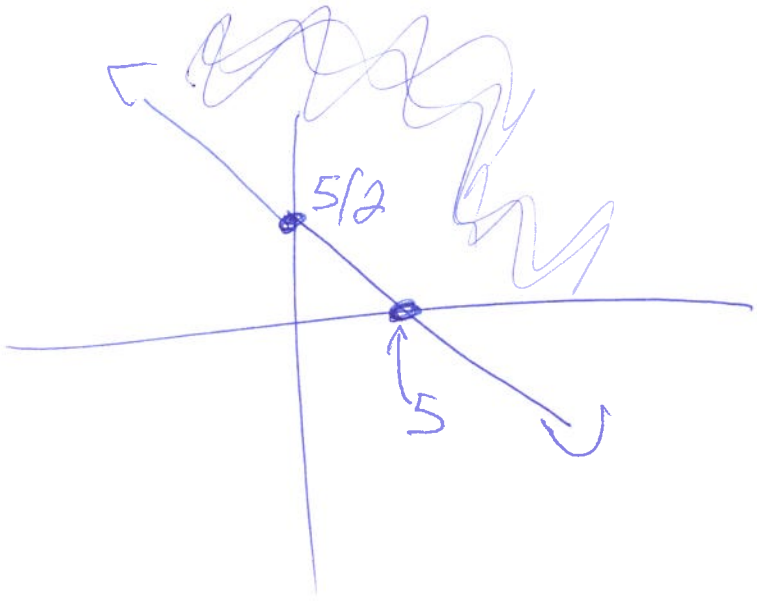
↳ $\leq$ Shade below line

Caution put inequality in slope-intercept form

Ex $x+2y \geq 5$

$2y \geq -x+5$

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



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

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

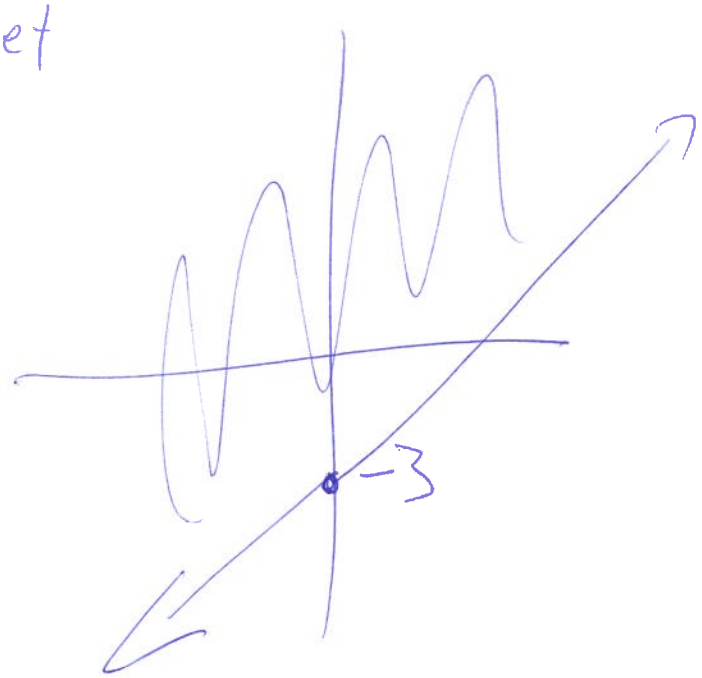
Ex $3x - 2y \leq 6$

Graph solution set

$3x - 6 \leq 2y$

$2y \geq 3x - 6$

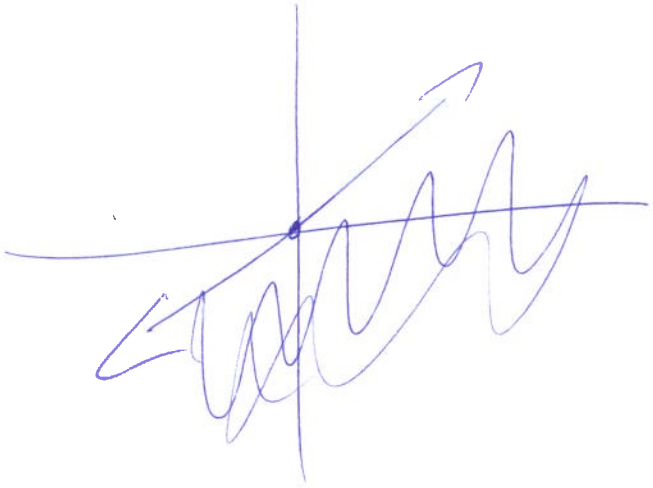
$y \geq \frac{3}{2}x - 3$



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.

$2x - 5y \leq 10$

$2x - 10 \leq 5y$

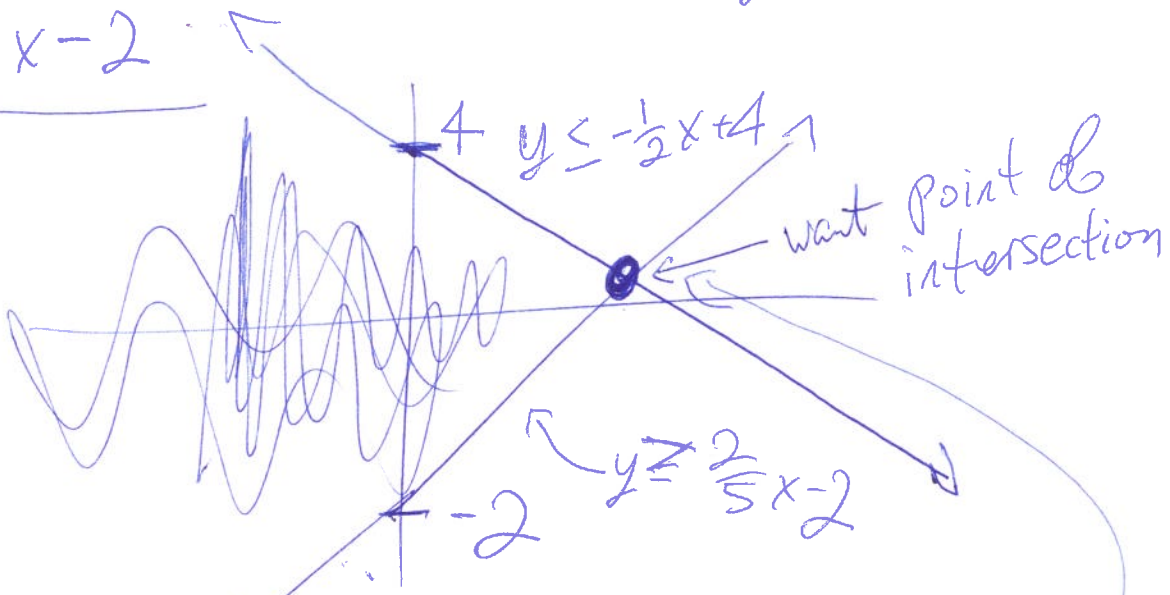
$5y \geq 2x - 10$

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

$x + 2y \leq 8$

$2y \leq -x + 8$

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



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

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

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

$x = \frac{60}{9}$

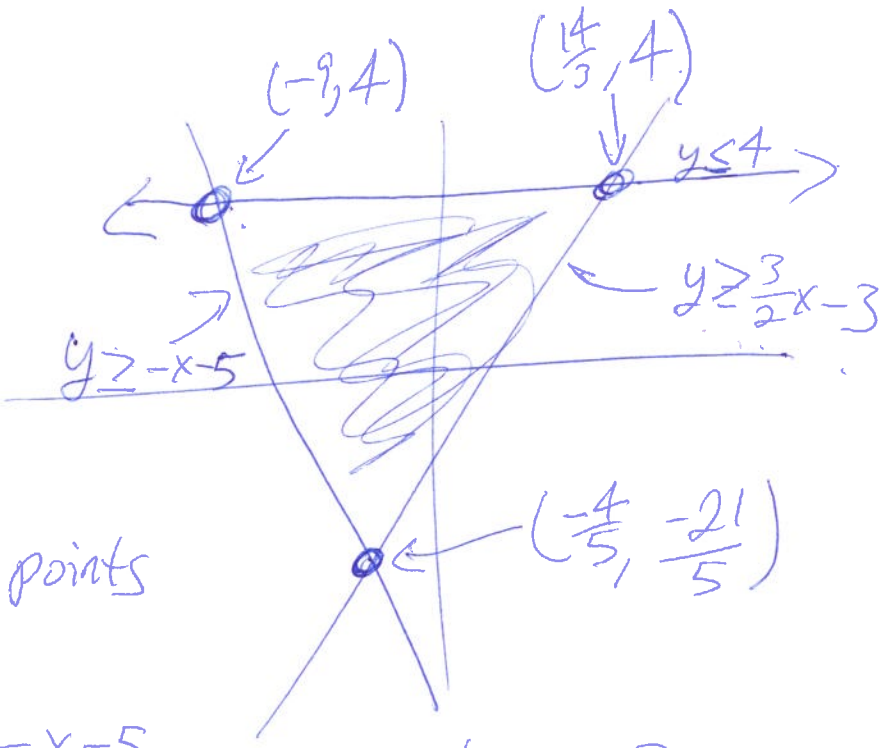
$y = \frac{-1}{2}\left(\frac{60}{9}\right) + 4$

Ex Graph:

$3x - 2y \leq 6$

$x + y \geq -5$

$y \leq 4$



And determine corner points

$y = -x - 5$ $\quad$ $4 = -x - 5$

$y = 4$ $\quad$ $9 = -x$

$x = -9$

Set $4 = \frac{3}{2}x - 3$

$7 = \frac{3}{2}x$

$x = \frac{2}{3}(7) = \frac{14}{3}$

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

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

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

Plug in $-\left(\frac{-4}{5}\right) - 5$

$= \frac{4}{5} - 5 =$ [illegible]

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

Third corner pt: $\left(\frac{-4}{5}, \frac{-21}{5}\right)$