Quiz 2: Parallel and Perpendicular Lines

Part A: Parallel

1. Line: $y = \frac{2}{3}x - 1$. Find the parallel line through $(3,4)$

Slope: $\frac{2}{3}$

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

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

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

2. Line: $6x - 2y = 4$. Find the parallel line through $(-2,5)$

$6x - 2y = 4$

$-2y = -6x + 4$

$y = 3x - 2$

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

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

$y - 5 = 3x + 6 + 5$

$y = 3x + 11$

3. $y = -\frac{3}{4}x + 2$. Find perpendicular line through $(0,-1)$

Slope $= -\frac{3}{4}$

$m_{\perp} = \frac{-1}{-\frac{3}{4}} = \frac{4}{3}$

$\frac{-1}{1} \div \frac{-3}{4} = \frac{4}{3}$

$y - (-1) = \frac{4}{3}(x - 0)$

$y + 1 = \frac{4}{3}x$ $\quad y = \frac{4}{3}x - 1$

4. Line $2x+5y=10$. Find the perpendicular line through $(0,-4)$

$2x+5y=10$

$5y=-2x+10$

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

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

$m_{\perp}=\frac{-1}{-\frac{2}{5}}=\frac{5}{2}$

$y-(-4)=\frac{5}{2}(x-0)$

$y+4=\frac{5}{2}x$

$y=\frac{5}{2}x-4$

Graphing Linear Equations: Cheat Sheet

1. Slope-Intercept Form: $(y = mx + b)$

- m = slope
- b = y-intercept = where line crosses the y axis

Steps:

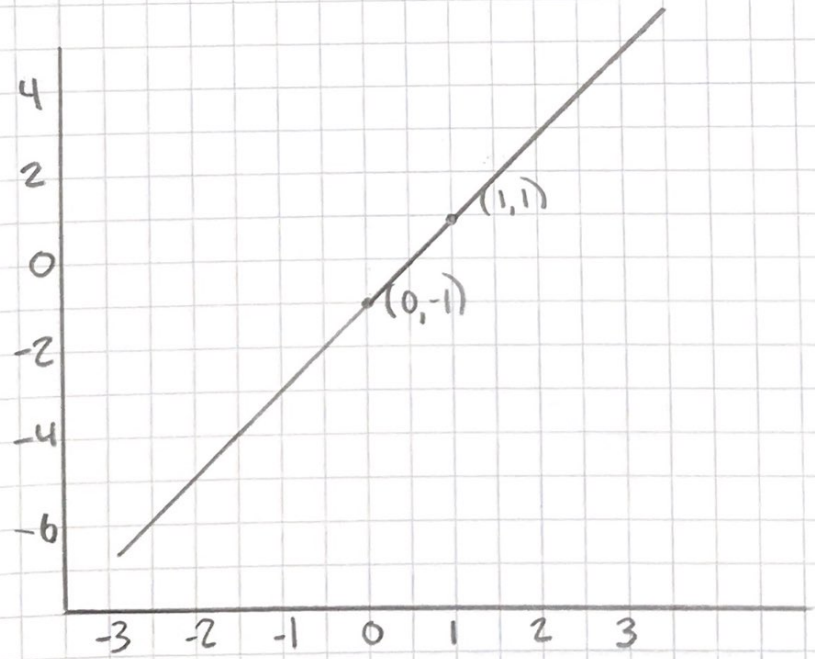
1. Plot the y-intercept $(0, b)$
2. Use slope $m = \frac{\text{rise}}{\text{run}}$ to find another point.
3. Connect the points with straight line.

Example: $y = 2x - 1$

$b = -1 \rightarrow$ plot $(0, -1)$

$m: 2 = \frac{2}{1} \rightarrow$ up 2, right 1 $\rightarrow (1, 1)$

Draw line through both.



2. Standard Form ($Ax + By = C$)

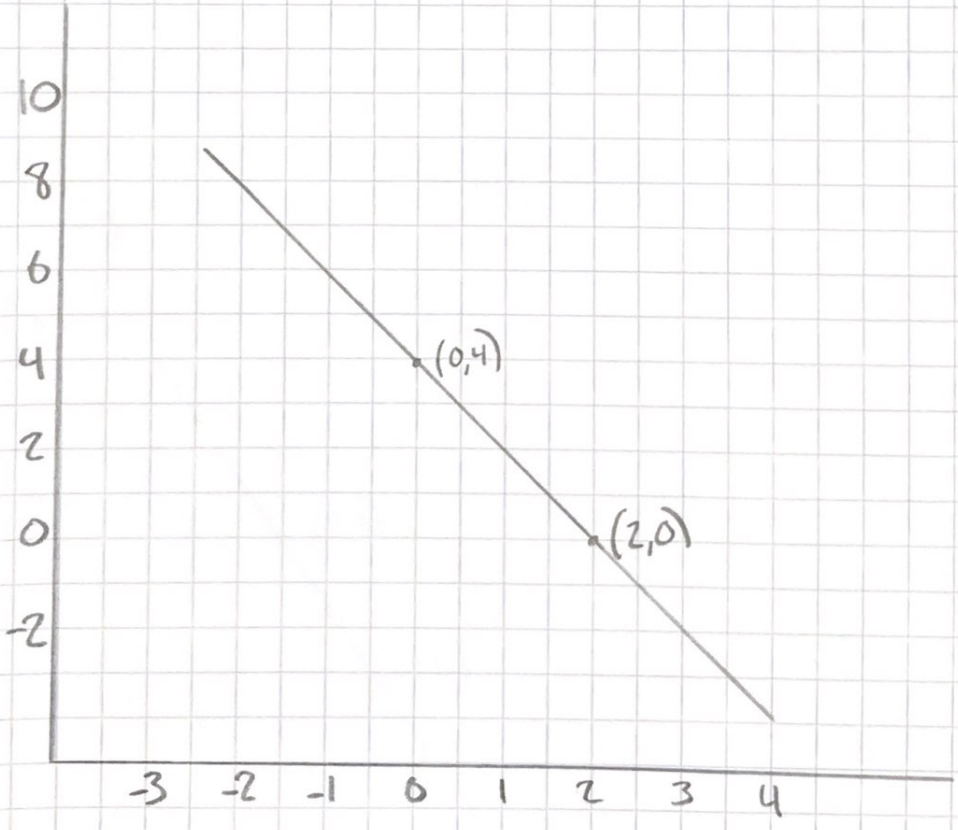
- Quick Method = Find Intercepts

Steps:

- Set $x = 0$, solve for $y \rightarrow$ y-intercept
- Set $y = 0$, solve for $x \rightarrow$ x-intercept
- Connect intercepts

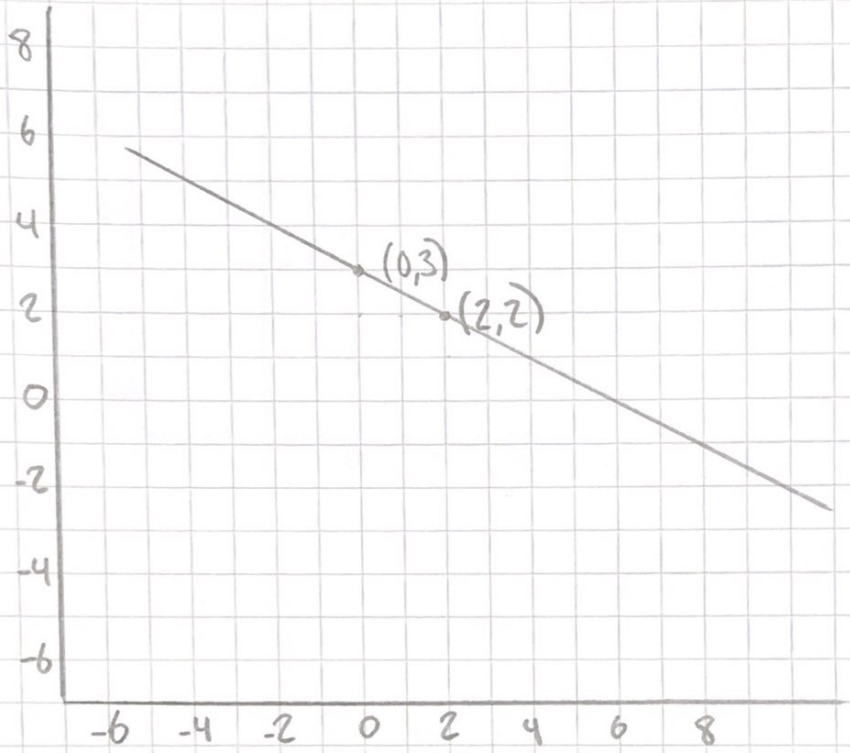
Example: $2x + y = 4$

- If $x = 0$: $y = 4 \rightarrow (0,4)$
- If $y = 0$: $x = 2 \rightarrow (2,0)$
- Draw line through both.

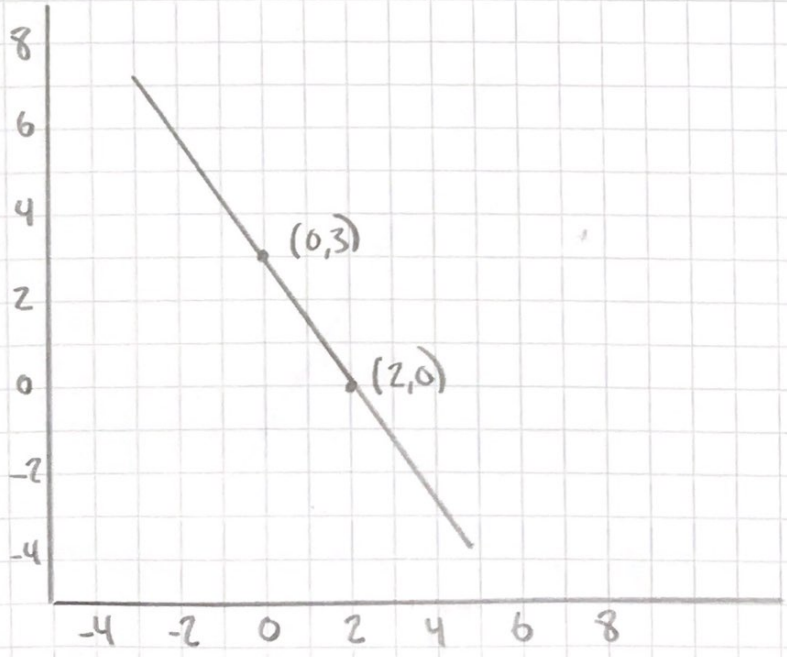


Graphing Mini Drill Set: 5 Questions

1. $y = -\frac{1}{2}x + 3$ $\quad m = -\frac{1}{2}$ $\quad b = 3 \rightarrow (0,3)$

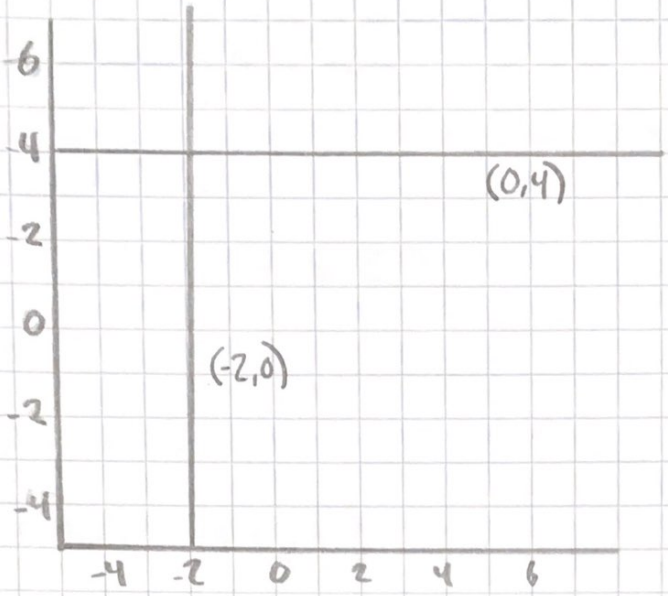


2. $3x + 2y = 6$ $\quad y = (0,3)$ $x = (2,0)$

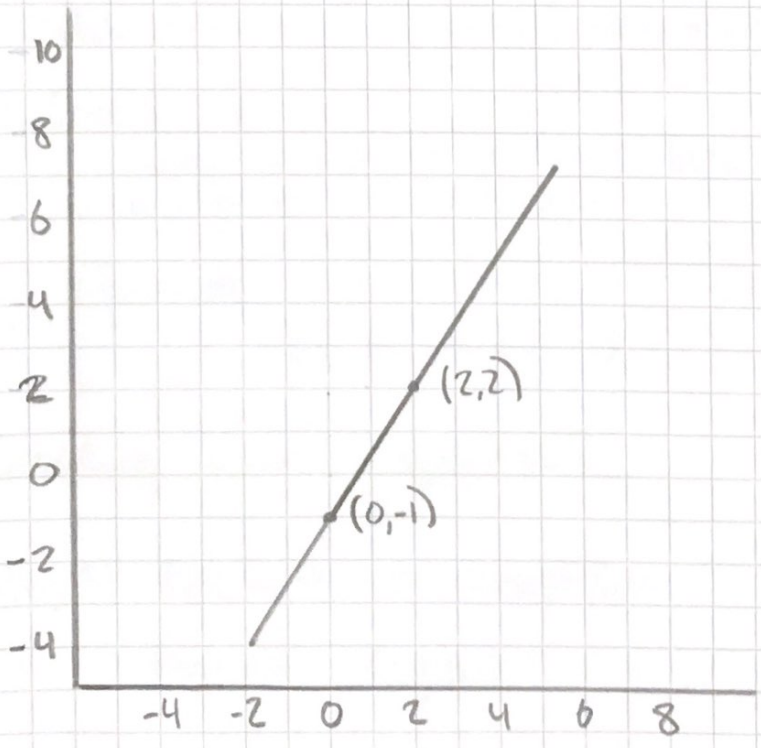


3. $y = 4$

4. $x = -2$



5. $y = \frac{3}{2}x - 1$ $\quad m = \frac{3}{2}$ $\quad b = -1$



Linear Inequalities Concept Notes:

What is a Linear Inequality?

- A linear inequality looks like a linear equation, but instead of "=" we use:

$$<, \leq, \geq, >$$

Example:

Equation: $2x + y = 5$

Inequality: $2x + y \leq 5$

- The solution is not just points on a line but a region of coordinate plane.

Rules for Solving Linear Inequalities?

1. Solve like normal equation (isolate x or y)
2. Special rule:
   - When multiplying or dividing both sides by a negative, flip the sign.

Example:

$$-2x > 6 \rightarrow x < -3$$

Graphing Linear Inequalities?

Step #1: Rewrite to slope-intercept form

Example: $2x + y \leq 4$

$$y \leq -2x + 4$$

Step #2: Graph Boundary Line

- If inequality is $\leq$ or $\geq$ solid line. (points on line included)
- If inequality is $<$ or $>$ dashed line. (points on line not included).

Step #3: Shade the correct half-plane

- Choose a test point (often (0,0), if not on the line).
- Plug into inequality:
  - If true → shade that side.
  - If false → shade opposite side.

Example:

$y > 2x - 1$

Step 1: Already in slope intercept

Step 2: Graph boundary line $y = 2x - 1$ with dashed line.

Step 3: Test point (0,0):

$0 > -1$ ✓ True → Shade the side containing (0,0)

Systems of Linear Inqualities:

- A system = 2 or more inequalities
- Solution = region of the plane that satisfies all inequalities
- The overlapping shaded area is the feasible solution set

Example System:

$$y \geq x + 1$$

$$y < -2x + 4$$

- Graph both line (solid for $\geq$, dashed for $<$)
- Shade each region.
- The solution = the intersection.

Start To Finish Example Problem:

Graph Problem: $2x + y \leq 4$

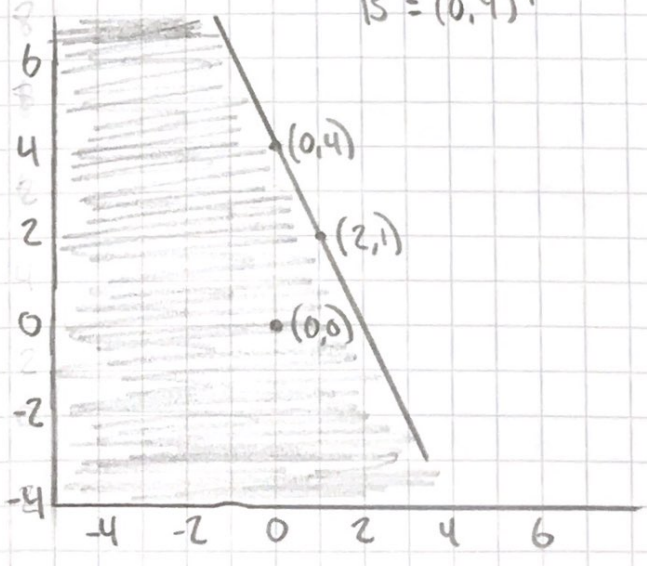
Step #1: Rewrite in slope intercept

$$2x + y \leq 4$$
$$-2x \qquad -2x$$
$$y \leq -2x + 4$$

Step #2 Graph the boundary line.

$y \leq -2x + 4$ Slope $= \frac{-2}{1}$ B $= (0, 4)$

- Since its $\leq$ → boundary line is a solid line.



Step #3 - Test a point

$0 \leq -2(0) + 4$

$0 \leq 4$ True

- So shade the side of the line that includes (0,0).

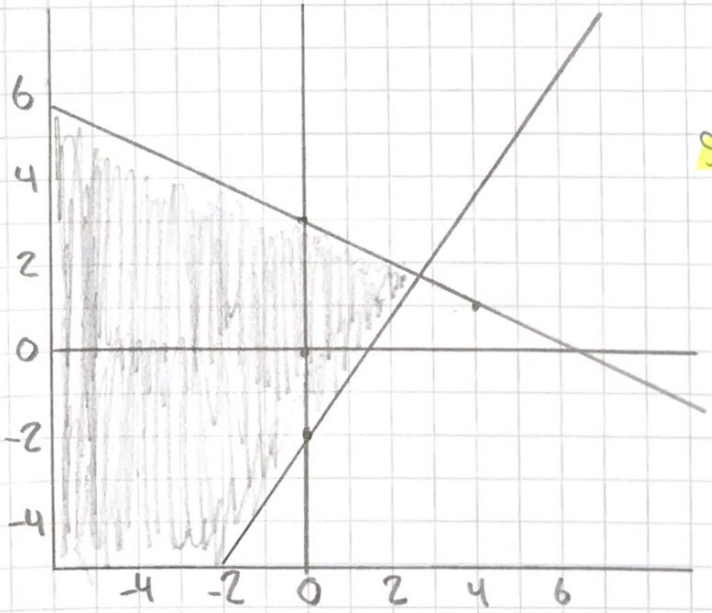
Systems of Linear Inequalities Example Problem:

Problem: Graph the system and identify the overlap:

$$\begin{cases} y \geq x - 2 \\ y \leq -\frac{1}{2}x + 3 \end{cases}$$

Step #1 Graph the first inequality

$y \geq x - 2$



Step #2 Graph second inequality

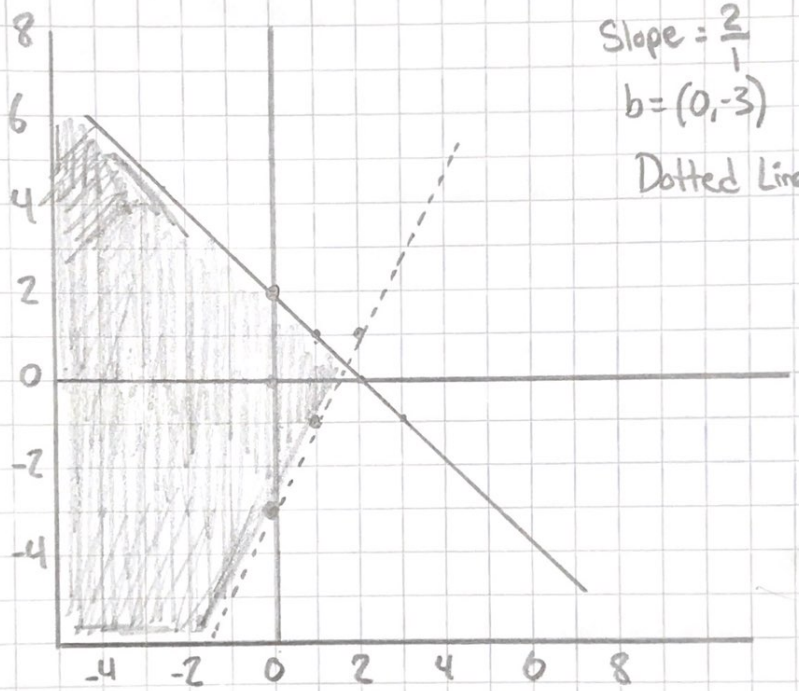
$y \leq -\frac{1}{2}x + 3$

Step #3 The Solution Region

- The solution is where both shadings overlap.

Example Problem #2: System of Inequalities

Graph the solution for: $\begin{cases} y > 2x - 3 \\ y \leq -x + 2 \end{cases}$



$y > 2x - 3$	$y \leq -x + 2$
Slope $= \frac{2}{1}$	Slope $= \frac{-1}{1}$
$b = (0, -3)$	$b = (0, 2)$
Dotted Line	Solid Line