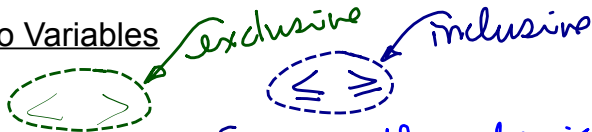
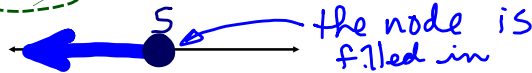


9.1 Inequalities in Two Variables

* Symbols of inequality:



* graphically, $x \leq 5$ looks like:

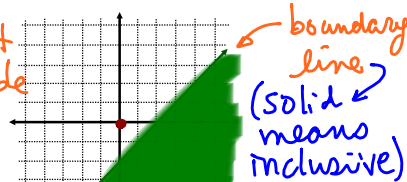


* A linear inequality in two variables however, describes an area on a cartesian plane either above or below the line:

ex. $y \leq x - 2$ looks like...

- ① graph $y = x - 2$
- ② test a point:

* always test $(0,0)$ if possible



false $\therefore (0,0)$ is not part of the solⁿ region.

* If we have an **exclusive** inequality ($<$ or $>$), we represent the boundary by a **dotted line** to indicate that the line itself is not part of the solution.

* To determine which side of the boundary is shaded, simply test a coordinate to see if it satisfies the inequality

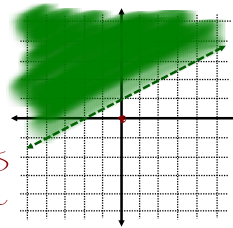
ex. graph $y > 0.5x + 1$

- ① graph $y = 0.5x + 1$ with a dotted line
- ② test $(0,0)$:

$$0 > 0.5(0) + 1$$

$$0 > 1 \text{ false}$$

\therefore the solⁿ does NOT contain $(0,0)$



ex. graph $10x - 5y > 15$

graph the equality

x-int: $y = 0$

$$10x - 5(0) = 15$$

$$\frac{10x}{10} = \frac{15}{10}$$

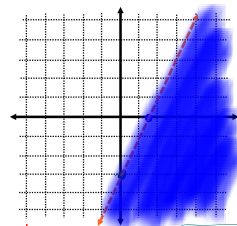
$$x = \frac{3}{2}$$

y-int: $x = 0$

$$10(0) - 5y = 15$$

$$\frac{-5y}{-5} = \frac{15}{-5}$$

$$y = -3$$



test $(0,0)$: $0 > 15$ false
so $(0,0)$ NOT in solⁿ

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$5x - 20y < 0$

graph equality

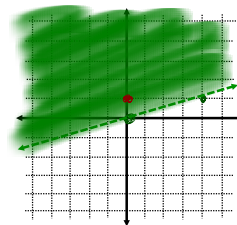
$$5x - 20y = 0$$

\rightarrow both x and y-ints = 0

write as $y = mx + b$

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

$$y = \frac{1}{4}x \quad m = \frac{1}{4}$$



test $(0,1)$: $5(0) - 20(1) < 0$

$$-20 < 0$$

true so colour the side of the graph containing $(0,1)$

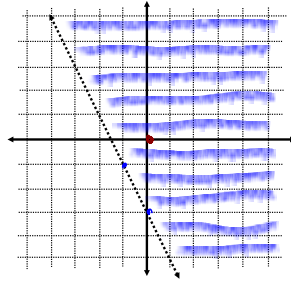
ex. What inequality is represented here?

- get equation of line

$$\Rightarrow y = mx + b$$

$$\begin{cases} m = -2 \\ b = -3 \end{cases}$$

$$y = -2x - 3$$



- is the boundary inclusive?

dotted so... $\Rightarrow < \text{ or } >$
NO

- test a point to determine direction of sign $\Rightarrow (0,0)$

$$\begin{aligned} LS = 0 \quad RS = -2(0) - 3 & \Rightarrow 0 > -3 \\ RS = -3 & \therefore y > -2x - 3 \\ \text{since } LS > RS & \end{aligned}$$

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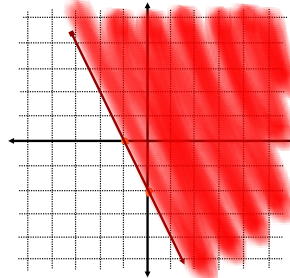
$$y = -2x - 2$$

test (0,0)

$$LS = 0 \quad RS = -2$$

$$LS \geq RS$$

$$\therefore y \geq -2x - 2$$



$x = \text{glass}$
 $y = \text{aluminium}$
cost max = 50 \$

$$\begin{aligned} & \text{glass} \quad \text{aluminium} \\ & \downarrow \quad \downarrow \\ 60x + 1.75y & \leq 50 \end{aligned}$$

$$\frac{1.75y}{1.75} \leq \frac{-60x + 50}{1.75}$$

$$y \leq \frac{-60}{1.75}x + \frac{50}{1.75}$$

consider domain and range

$$D: \{x \in \mathbb{R} \mid 0 < x \leq \frac{5}{6}\}$$

$$R: \{y \in \mathbb{R} \mid 0 < y \leq 28.6\}$$

See example 4 pg. 470

Homefun: Pg. 472 #1ab, 2ab, 4, 5ab, 8ab, 9-11, 13

when $y = 0 \dots$
 $x = \frac{50}{60} = \frac{5}{6}$

when $x = 0$
 $60(0) + \frac{1.75y}{1.75} = \frac{50}{1.75}$

$$y = \frac{50}{1.75}$$

greater than

$$y = 3x - 5$$

on graphing calculator

less than