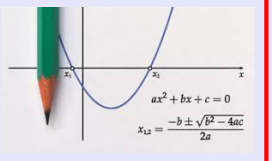
Math 125

Spring 2022

Lecture 7



Solve $-8 < 4 - 2x \leq 6$

$-8 < -2x + 4 \leq 6$

Subtract 4 $\quad -8-4 < -2x+4-4 \leq 6-4$

$-12 < -2x \leq 2$

Divide by -2 $\quad \frac{-12}{-2} > \frac{-2}{-2}x \geq \frac{2}{-2}$

$6 > x \geq -1 \Rightarrow \boxed{-1 \leq x < 6}$

Graphing

I.N. $[-1, 6)$ S.B.N. $\{x \mid -1 \leq x < 6\}$

$A = \{2, 3, 4, 5\}$ $B = \{4, 5, 6, 7\}$

Find

1) $A \cup B = \{2, 3, 4, 5, 4, 5, 6, 7\} \Rightarrow A \cup B = \{2, 3, 4, 5, 6, 7\}$

2) $A \cap B = \{4, 5\}$

Find the domain: $f(x) = \frac{x-1}{x-5}$ $\rightarrow x - 5 \neq 0$

$x \neq 5$

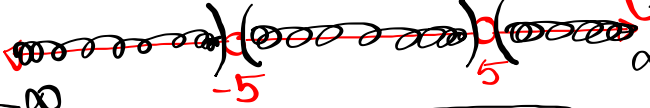
$(-\infty, 5) \cup (5, \infty)$

All Reals except 5

Find the domain: $f(x) = \frac{x-1}{x^2-25}$ $\rightarrow x^2 - 25 \neq 0$

$x^2 \neq 25$

$x \neq \pm 5$



$(-\infty, -5) \cup (-5, 5) \cup (5, \infty)$

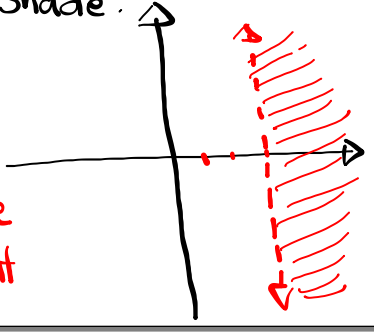
Graph & Shade:

$x > 3$

V.L.

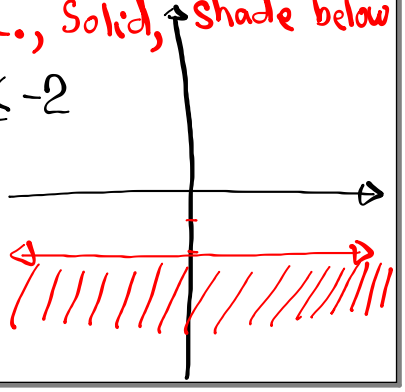
Dotted line

Shade right



H.L., Solid, Shade below

$y \leq -2$



Graph the Solution

$2x - 3y > 21$

Hint: write in Slope-Int Form.

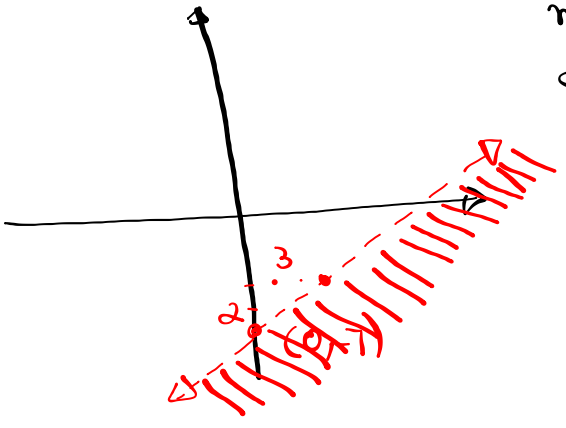
$-3y > -2x + 21$

$\frac{-3}{-3}y < \frac{-2}{-3}x + \frac{21}{-3}$

$y < \frac{2}{3}x - 7$

$m = \frac{2}{3}$, Y-Int $(0, -7)$

Slant line, Dotted line, Shade below

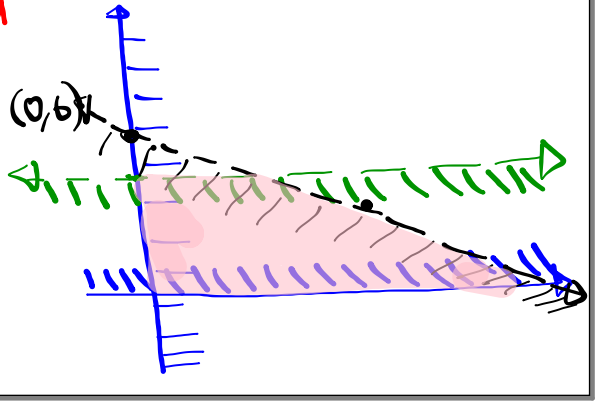


Graph

$\begin{cases} x \geq 0 & \text{Solid, Y-axis, shade right} \\ y \geq 0 & \text{Solid, X-axis, shade above} \\ y < 4 & \text{Dotted, H.L., shade below} \\ 3x + 8y < 48 & \text{Dotted} \end{cases}$

$8y < -3x + 48$

$y < \frac{-3}{8}x + 6$



Find equation of a line that contains the point $(5, -3)$ with

x_1 y_1

1) Zero Slope

Horizontal line $\Rightarrow$ Y-only $\Rightarrow$ $\boxed{y = -3}$

2) No Slope

Vertical line $\Rightarrow$ x-only $\Rightarrow$ $\boxed{x = 5}$

3) with slope $\frac{3}{5}$.

Point-slope Formula

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

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

$y + 3 = \frac{3}{5}x - \frac{3}{5} \cdot 5$

$y + 3 = \frac{3}{5}x - 3$

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

$\boxed{y = \frac{3}{5}x - 6}$

SG 4 3 ✓

Solve

$2(x-3) + 4 < -10$ OR $4x + 8 \leq 6x - 4$

$2x - 6 + 4 < -10$

$2x - 2 < -10$

$2x < -10 + 2$

$2x < -8$

$x < -4$

OR

$4x - 6x \leq -4 - 8$

$-2x \leq -12$

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

$x \geq 6$

I.N. $(-\infty, -4) \cup [6, \infty)$

S.B.N. $\{x \mid x < -4 \text{ OR } x \geq 6\}$

Solve

$3(x+1)-2<2x+12$ AND $-2x+2\leq 12$

$3x+3-2<2x+12$

$3x+1<2x+12$

$3x-2x<12-1$

$x<11$

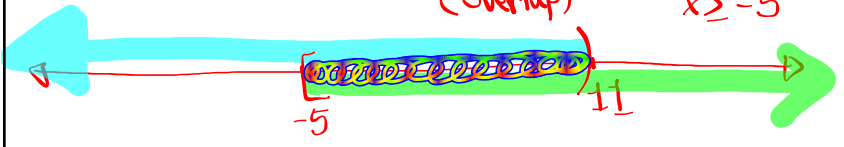
$-2x\leq 12-2$

$-2x\leq 10$

$\frac{-2}{-2}x\geq\frac{10}{-2}$

$x\geq -5$

AND (overlap)



I.N. $[-5, 11)$

S.B.N. $\{x \mid -5\leq x<11\}$

SG 5 Page 1
SG 6 Page 1

Absolute Value equations:

Type I: $|ax+b|=K$

IF $K<0$, there is no solution

IF $K\geq 0$, then Solve

$ax+b=K$ OR $ax+b=-K$

Place Final Solution in a Solution Set.

Solve $|x-2|=-5$

No solution

Solve $|x-2|=5$

$x-2=5$ OR $x-2=-5$

$\boxed{x=7}$ $\boxed{x=-3}$

$\{-3, 7\}$

Solve $|2x+3| = -9$

No Solution $\Rightarrow \emptyset$

Solve $|2x+3| = 9$

$2x+3=9$ OR $2x+3=-9$

$2x=6$ $\quad 2x=-12$

$\boxed{x=3}$ $\quad \boxed{x=-6}$

$\{-6, 3\}$

Solve $|3x+5|+8=2$

Hint: Isolate the abs. Value

$|3x+5| = 2-8$

$|3x+5| = -6 \Rightarrow$ No Solution $\Rightarrow \emptyset$

Solve $|3x+5|+8=12$

$|3x+5| = 12-8$

$|3x+5| = 4$

$3x+5=4$ OR $3x+5=-4$

$3x=4-5$ $\quad 3x=-4-5$

$3x=-1$ $\quad 3x=-9$

$\boxed{x=\frac{-1}{3}}$ $\quad \boxed{x=-3}$

$\{-3, \frac{-1}{3}\}$

Solve $-2|2x-3|+10=-8$

Always Isolate the Abs. Value.

$-2|2x-3| = -8-10$

$-2|2x-3| = -18$

$|2x-3| = \frac{-18}{-2}$

$|2x-3| = 9$

$2x-3=9$ OR $2x-3=-9$

$2x=12$ $\quad 2x=-6$

$x=6$ $\quad x=-3$

$\{-3, 6\}$

Abs. Value Equations:

Type II: $|ax+b| = |cx+d|$

Solve

$ax+b=cx+d$ OR $ax+b=-(cx+d)$

Final Answers in a Solution Set

Solve $|2x-3| = |x+5|$

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

$2x-x=5+3$ $\quad 2x-3=-x-5$

$x=8$ $\quad 2x+x=-5+3$

$3x=-2$

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

$\{\frac{-2}{3}, 8\}$

Solve $|3x+2| = |2x+3|$

Solve

$3x+2 = 2x+3$ OR $3x+2 = -(2x+3)$

$3x-2x = 3-2$

$x = 1$

$3x+2 = -2x-3$

$3x+2x = -3-2$

$5x = -5$

$x = -1$

Solution Set

$\{\pm 1\}$

Solve $|x+8| = |x-8|$

Solve $x+8 = x-8$ OR $x+8 = -(x-8)$

$x-x = -8-8$

$0 = -16$

False

$x+8 = -x+8$

$x+x = 8-8$

$2x = 0$

$x = \frac{0}{2}$ $x = 0$

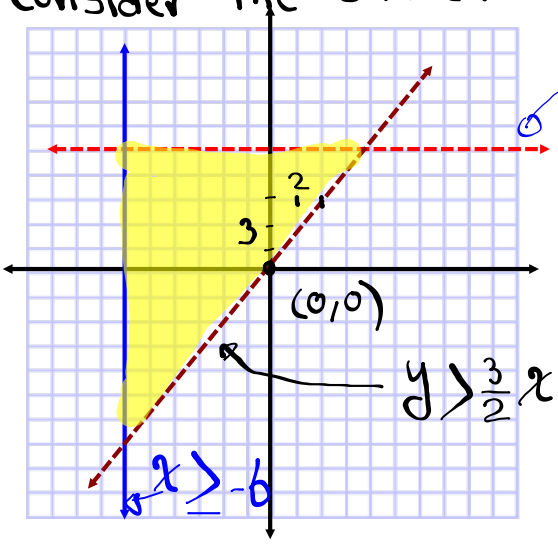
$\{0\}$

Do not use $\emptyset$ for Zero.

You should be able to solve problems on pages 2-4 of SG 5 & 6.

Exam I → Next Thursday

Consider the shaded region below



$y < 5$

$y > \frac{3}{2}x + 0$

$x \geq -6$

$$\begin{cases} x \geq -6 \\ y < 5 \\ y > \frac{3}{2}x \end{cases}$$

Simplify: $\dfrac{x^2 - 4x}{x^2 - 16} = \dfrac{x(x-4)}{(x+4)(x-4)}$

$= \boxed{\dfrac{x}{x+4}}$

Simplify: $\dfrac{x^2 - 25}{x^2 - 10x + 25} = \dfrac{(x+5)(x-5)}{(x-5)(x-5)}$

$= \boxed{\dfrac{x+5}{x-5}}$

Simplify $\dfrac{x^2-7x+12}{x^2-9} \div \dfrac{x^2+8x+16}{x^2+4x}$

$= \dfrac{x^2-7x+12}{x^2-9} \cdot \dfrac{x^2+4x}{x^2+8x+16}$

$= \dfrac{(x-3)(x-4)}{(x+3)(x-3)} \cdot \dfrac{x(x+4)}{(x+4)(x+4)} = \boxed{\dfrac{x(x-4)}{(x+3)(x+4)}}$

Simplify $\dfrac{2}{3} - \dfrac{1}{5} =$

$\dfrac{2\cdot 5}{3\cdot 5} - \dfrac{1\cdot 3}{5\cdot 3} = \dfrac{10}{15} - \dfrac{3}{15}$

$= \dfrac{10-3}{15} = \boxed{\dfrac{7}{15}}$

Simplify $\dfrac{2}{x-3} - \dfrac{1}{x+5} =$

$\dfrac{2(x+5)}{(x-3)(x+5)} - \dfrac{1(x-3)}{(x+5)(x-3)} =$

Work on SG 5 SG 6

$\dfrac{2(x+5)-1(x-3)}{(x-3)(x+5)} = \dfrac{2x+10-x+3}{(x-3)(x+5)}$

$= \boxed{\dfrac{x+13}{(x-3)(x+5)}}$

Class QZ 5

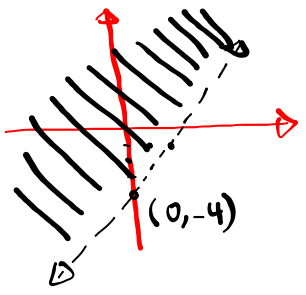
1) Graph and shade

$3x - 2y < 8$

$-2y < -3x + 8$

$y > \frac{-3}{-2}x + \frac{8}{-2}$

$y > \frac{3}{2}x - 4$



2) Factor

$4x - 36$

$4(x - 9)$