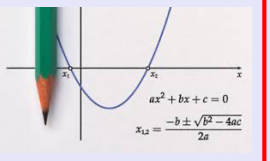
Math 125

Spring 2022

Lecture 6



Class QZ 4

$f(x) = 3x + 4$ $\quad g(x) = 3x - 4$

Find

1) $(f+g)(x) = f(x) + g(x)$

$= 3x + 4 + 3x - 4$

$= \boxed{6x}$ ✓

2) $(f-g)(x)$

$= f(x) - g(x)$

$= 3x + 4 - (3x - 4)$

$= 3x + 4 - 3x + 4 = \boxed{8}$ ✓

3) $(f \cdot g)(x)$

$= f(x) \cdot g(x)$

$= (3x+4)(3x-4) = 9x^2 - 12x + 12x - 16 = \boxed{9x^2 - 16}$ ✓

Soil

Given $f(x) = x - 2$, $g(x) = x^2 + 2x + 4$

Find

1) $f(-2) = -2 - 2$

$= \boxed{-4}$

2) $g(-3) = (-3)^2 + 2(-3) + 4$

$= 9 - 6 + 4 = \boxed{7}$

3) $(f + g)(x) =$

$f(x) + g(x) =$

$x - 2 + x^2 + 2x + 4 =$

$\boxed{x^2 + 3x + 2}$

4) $(f - g)(x) =$

$f(x) - g(x) =$

$x - 2 - (x^2 + 2x + 4) =$

$x - 2 - x^2 - 2x - 4 =$

$\boxed{-x^2 - x - 6}$

5) $(f \cdot g)(x) = f(x) \cdot g(x)$

$= (x - 2)(x^2 + 2x + 4)$

FOIL

$= x^3 + 2x^2 + 4x - 2x^2 - 4x - 8$

$= \boxed{x^3 - 8}$

6) $(g/f)(x)$

$= \dfrac{g(x)}{f(x)}$; $f(x) \neq 0$

$= \dfrac{x^2 + 2x + 4}{x - 2}$; $\boxed{x - 2 \neq 0}$

$\boxed{x \neq 2}$

Consider

$$f(x) = \begin{cases} \frac{1}{x-2} & \text{if } x < 0 \\ 8 & \text{if } 0 \le x < 4 \\ \sqrt{x+5} & \text{if } x \ge 4 \end{cases}$$

Find

1) $f(-2) = \frac{1}{-2-2} = \frac{1}{-4} = \boxed{\frac{-1}{4}}$

2) $f(0) = \boxed{8}$

3) $f(4) = \sqrt{4+5} = \sqrt{9} = \boxed{3}$

$f(x) = x^2 - 2x$, Find

1) $f(3x)$

$= (3x)^2 - 2(3x)$

$= \boxed{9x^2 - 6x}$

2) $f(x+3)$

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

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

(Soil) (Distribute)

$= x^2 + 3x + 3x + 9 - 2x - 6$

$= \boxed{x^2 + 4x + 3}$

$A = \{1, 2, 3, 4, 5\}$

$B = \{5, 6, 7, 8, 9, 10\}$

Find

1) $A \cup B =$

$\{1,2,3,4,5,6,7,8,9,10\}$

$= \{1, 2, 3, \ldots, 10\}$

2) $A \cap B =$

$\{5\}$

$A = \{1, 10\}$ $B = \{2, 6, 8\}$ $C = \{3, 5, 7, 9\}$

1) $A \cup B \cup C = \{1,10,2,6,8,3,5,7,9\} = \{1,2,3,5,6,7,8,9,10\}$

2) $A \cap B = \phi$ $\{\ \}$

3) $A \cap C = \phi$ $\{\ \}$

4) $B \cap C = \phi$ $\{\ \}$

Solve $-6 < 2x - 4 \leq 20$

Hint: Isolate x in the middle.

$-6+4 < 2x - 4 + 4 \leq 20+4$

$-2 < 2x \leq 24$

$\frac{-2}{2} < \frac{2}{2}x \leq \frac{24}{2}$

$-1 < x \leq 12$

Graph

I.N. $(-1, 12]$

S.B.N. $\{x \mid -1 < x \leq 12\}$

Solve $-5 < 4 - 3x \leq 19$

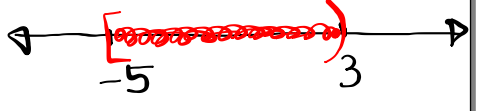
$-5-4 < 4-3x-4 \leq 19-4$

$-9 < -3x \leq 15$

$\frac{-9}{-3} > \frac{-3}{-3}x \geq \frac{15}{-3}$

$3 > x \geq -5$

$-5 \leq x < 3$



I.N. $[-5, 3)$

S.B.N. $\{x \mid -5 \leq x < 3\}$

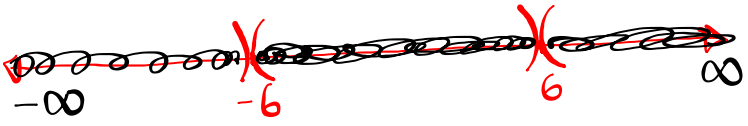
Find the domain of $f(x) = \dfrac{x}{x^2 - 36}$.

$x^2 - 36 \neq 0$

$x^2 \neq 36$

$x \neq \pm 6$

All Reals except ± 6



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

S.B.N. $\{x \mid x \neq \pm 6\}$

Graphing inequalities in two-variables:

$y < mx + b$ $\quad$ $y > mx + b$ $\quad$ Dotted

$y \leq mx + b$ Shade below $\quad$ $y \geq mx + b$ Solid Shade above

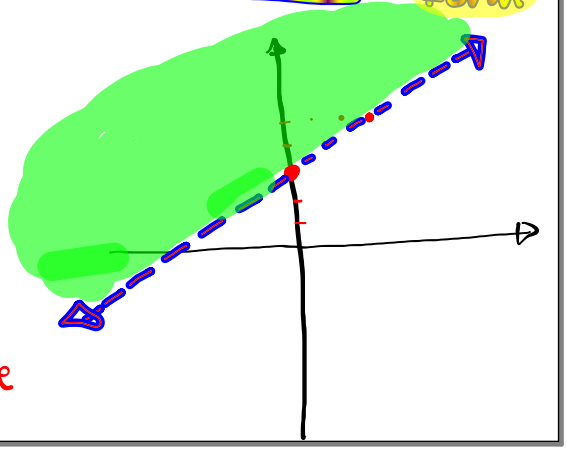
Slant lines, Slope-Int. Form

Graph & shade

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

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

Dotted line, Shade above



Graph & shade

$3x - 4y \geq 8$

write in Slope-Int. Form

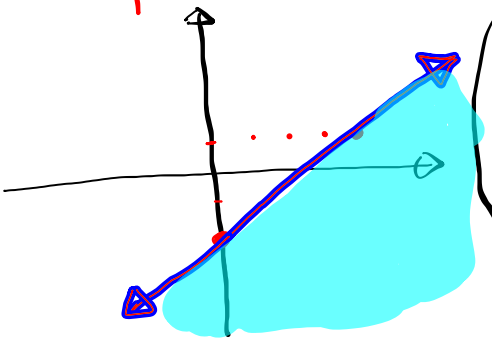
$-4y \geq -3x + 8$

$\frac{-4}{-4}y \leq \frac{-3}{-4}x + \frac{8}{-4}$

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

$m = \frac{3}{4}$, Y-Int $(0, -2)$

Solid line, shade below



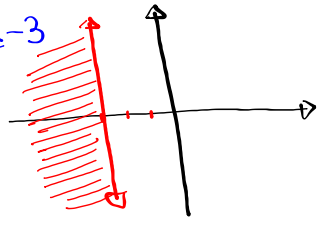
Inequalities for special lines:

$x < a$	$x \leq a$	Shade left	Vertical lines
$x > a$ Dotted	$x \geq a$ Solid	Shade right	
$y < b$	$y \leq b$	Shade below	Horizontal lines
$y > b$ Dotted	$y \geq b$ Solid	Shade above	

Graph & shade

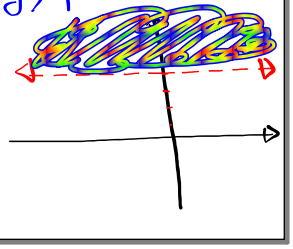
1) $x \leq -3$

V.L. Solid left



2) $y > 4$

H.L., Dotted, above



Graph & shade

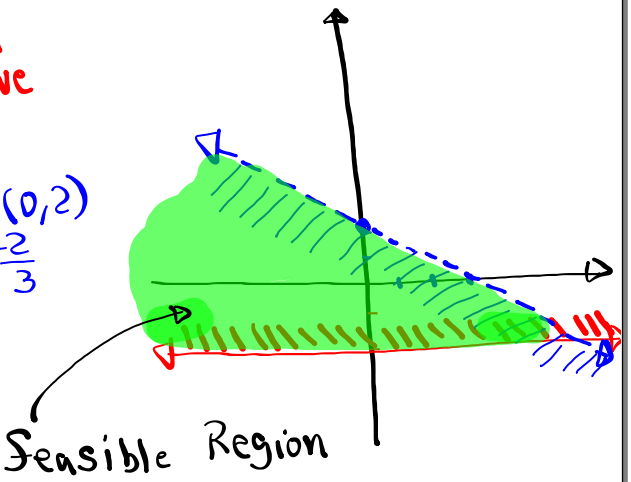
$y \geq -2$ → H.L. Solid Above

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

Slope-Int, Slant, Dotted, Below

Y-Int (0, 2)

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



Feasible Region

Solve & shade the feasible region:

✓ $x > -2$

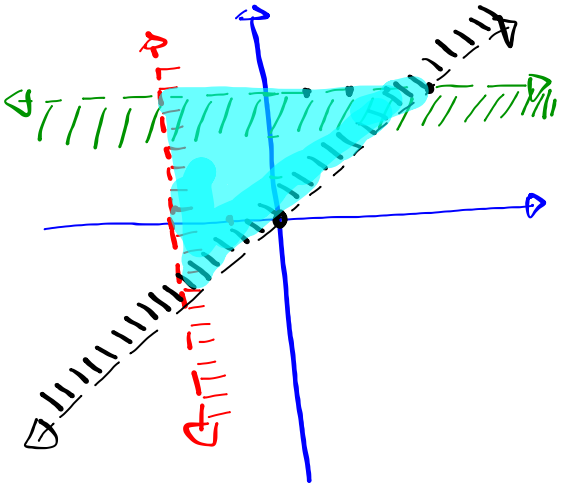
✓ $y < 3$

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

Y-Int (0, 0)

$m = \frac{3}{4}$

Dotted above



SG 4 ✓

Work on SG 5 as well. look for online QZ this Sunday

Compound Inequalities:

1) OR

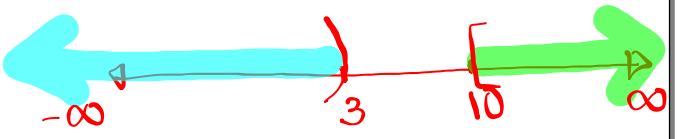
a) Solve & graph

b) Final answer is all shaded segments

$3x-2<7$ OR $2x+5\geq 25$

$3x<9$ OR $2x\geq 20$

$x<3$ OR $x\geq 10$



I.N. $(-\infty,3)\cup[10,\infty)$

S.B.N. $\{x \mid x<3 \text{ OR } x\geq 10\}$

Compound Inequalities:

2) AND

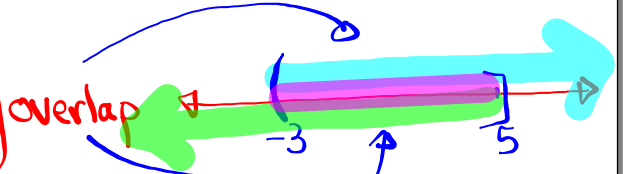
a) Solve & graph

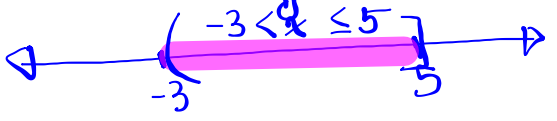
b) Final answer is only the common shaded segment

$3x+5>-4$ AND $2x-7\leq 3$

$3x>-9$ $2x\leq 10$

$x>-3$ AND $x\leq 5$





S.B.N. $\{x \mid -3<x\leq 5\}$

I.N. $(-3,5]$

Solve:

$2(x-1)+3<13$ OR $2x-8\leq 5x+7$

$2x-2+3<13$

$2x+1<13$

$2x<12$

$x<6$

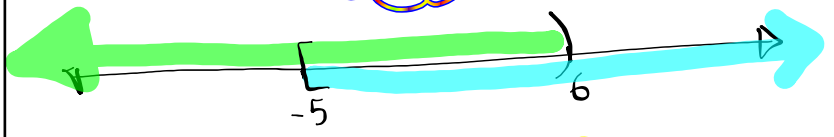
$2x-5x\leq 7+8$

$-3x\leq 15$

$\frac{-3}{-3}x\geq\frac{15}{-3}$

$x\geq -5$

OR



I.N. $(-\infty,\infty)$, S.B.N. $\{x \mid x \text{ is any real } \#\}$

$\mathbb{R}$

Solve

$\frac{1}{2}x-\frac{1}{4}<-8$ AND $\frac{2}{3}x+\frac{1}{2}\geq\frac{5}{6}$

LCD = 4

$4\cdot\frac{1}{2}x-4\cdot\frac{1}{4}<4(-8)$

$2x-1<-32$

$2x<-31$

$x<\frac{-31}{2}$

$x<-15.5$

LCD = 6

$6\cdot\frac{2}{3}x+6\cdot\frac{1}{2}\geq 6\cdot\frac{5}{6}$

$4x+3\geq 5$

$4x\geq 2$

$x\geq\frac{2}{4}$

$x\geq\frac{1}{2}$

$x\geq .5$

AND

No overlap ⇒ No Solution

$\emptyset$

Tutoring ✓
NC Math ✓
SI ✓
office hours

1) Factor $x^2 - 6x + 8 = (x-2)(x-4)$

2) Factor $x^2 - 16 =$

$\rightarrow x^2 - 4^2 = (x-4)(x+4)$

$\rightarrow A^2 - B^2 = (A+B)(A-B)$

3) Simplify $\dfrac{x^2-6x+8}{x^2-16} = \dfrac{(x-2)(x-4)}{(x-4)(x+4)}$

$= \boxed{\dfrac{x-2}{x+4}}$

4) Simplify

$$\frac{x^2+8x+15}{x^2-25} \div \frac{x^2-9}{x^2-8x+15}$$

$$= \frac{x^2+8x+15}{x^2-25} \cdot \frac{x^2-8x+15}{x^2-9}$$

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

$= \boxed{1}$