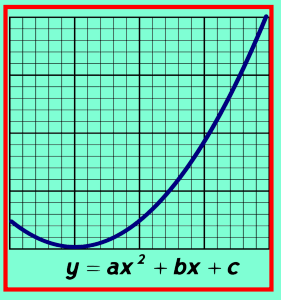
Math 125

Fall 2021

Lecture 12



Set: A collection of objects

Notation { }

Set elements are to be seperated by ,.

Set of all whole number less than 10

$\{0, 1, 2, \ldots, 7, 8, 9\}$

Set of all positive integers from 8 to 13.

$\{8, 9, 10, 11, 12, 13\}$

Consider the Set below

$A = \{ Mike, Mary, Moe \}$

Mike is an element of A $Mike \in A$

Bob is not an element of A $Bob \notin A$

$B = \{ 2, 4, 6, 8, 10 \}$ $2 \in B$

$5 \notin B$

operations with Sets

Union $\cup$ $A \cup B$ ⇒ elements of Both Sets in a new Set. (No need to repeat Common element

Intersection $\cap$ $A \cap B$ ⇒ only the Common elements

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

$B = \{4, 5, 6, 7\}$

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

$A \cap B = \{4\}$

$A = \{2, 4, 6, 8\}$

$B = \{1, 3, 5, 7, 9\}$

Find $A \cup B$ & $A \cap B$

$A \cup B = \{1, 3, 5, 7, 9, 2, 4, 6, 8\}$

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

$= \{1, 2, 3, \ldots, 8, 9\}$

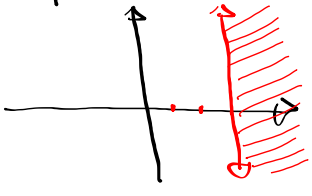
$A \cap B =$ No common element

$= \{\}$ empty set

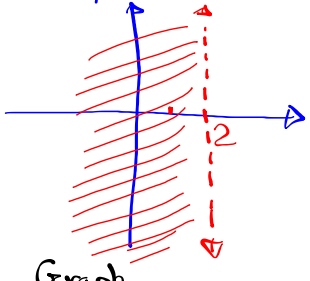
$\emptyset$

Graphing inequalities in rectangular coordinate system:

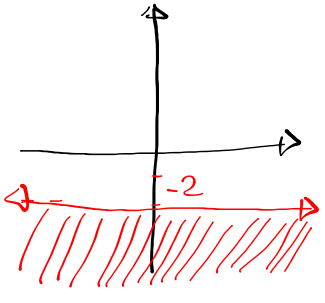
Graph $x \geq 3$



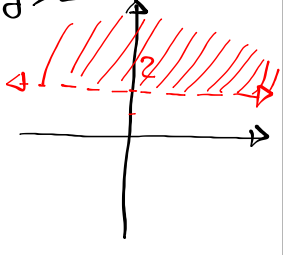
Graph $x < 2$



Graph $y \leq -2$



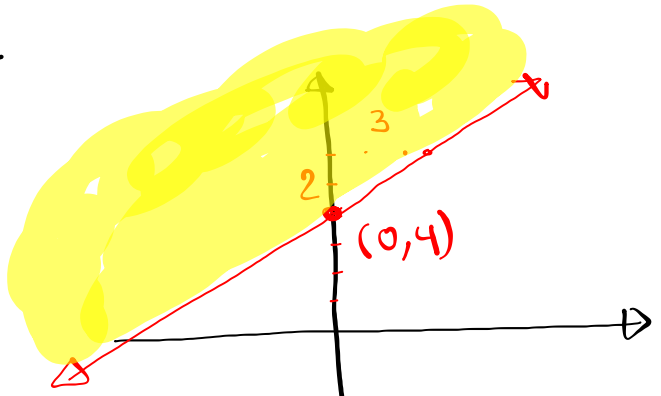
Graph $y > 2$



Graph & Shade

$y \geq \frac{2}{3}x + 4$

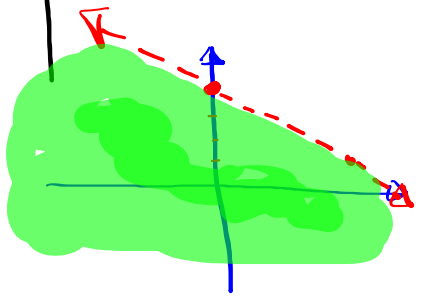
Solid
Slant line
Shade above



Graph & Shade

$y < \frac{-3}{5}x + 4$

Broken line (Dotted line)
Slant line, Shade below



Graph & shade

$3x - 2y > 8$

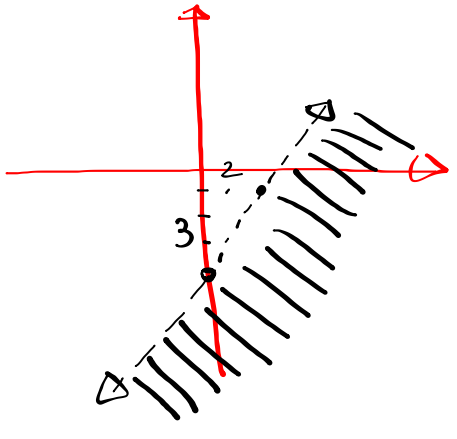
$-2y > -3x + 8$

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

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

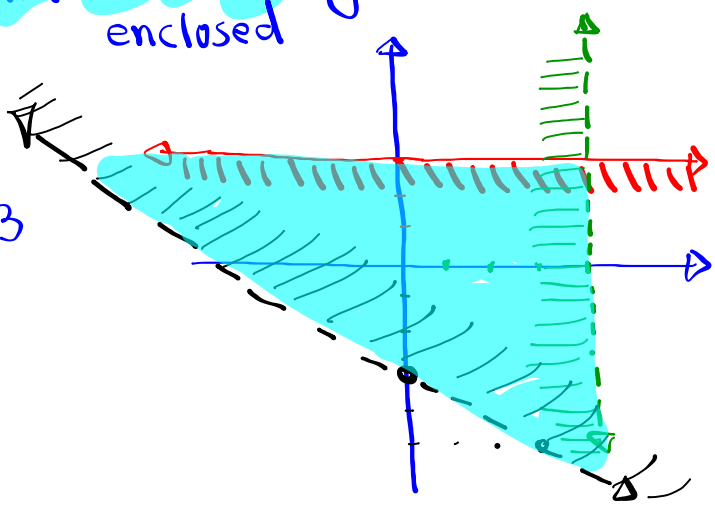
Slant, Dotted,
Shade below

Hint:
write in
Slope-Int
form.



Shade the region bounded by enclosed

$$\begin{cases} y \le 3 \\ x < 4 \\ y > -\frac{2}{3}x - 3 \end{cases}$$



Solve

$-5 < -2x + 1 \le 9$

$-5 - 1 < -2x + 1 - 1 \le 9 - 1$

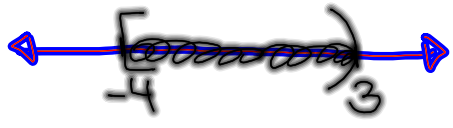
$-6 < -2x \le 8$

Divide by -2

$$\frac{-6}{-2} > \frac{-2}{-2}x \ge \frac{8}{-2}$$

$3 > x \ge -4$

$-4 \le x < 3$



$[-4, 3)$

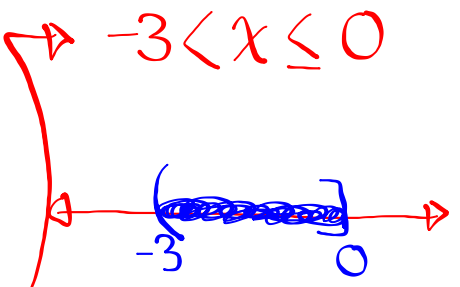
Set-Builder notation $\{x \mid -4 \le x < 3\}$

$7 > -3x - 2 \geq -2$

$7+2 > -3x-2+2 \geq -2+2$

$9 > -3x \geq 0$

$\frac{9}{-3} < \frac{-3}{-3}x \leq \frac{0}{-3}$



$-3 < x \leq 0$

$(-3, 0]$

S.B.N. $\{x \mid -3 < x \leq 0\}$

$f(x) = x^2 - 2x + 3$ $\quad$ $g(x) = 2x - 3$

Find

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

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

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

$= \boxed{x^2}$

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

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

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

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

$= \boxed{x^2 - 4x + 6}$

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

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

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

$= 2x^3 - 3x^2 - 4x^2 + 6x + 6x - 9 =$

$= \boxed{2x^3 - 7x^2 + 12x - 9}$

4) $(f/g)(x) = \frac{f(x)}{g(x)}$; $g(x) \neq 0$

$= \frac{x^2 - 2x + 3}{2x - 3}$; $2x - 3 \neq 0$, $x \neq \frac{3}{2}$

$$f(x)=\begin{cases}|x^2-4| & \text{if } x<0\\ x^3-2x & \text{if } x\geq 0\end{cases}$$

$|x^2-4|$: $x<0$ | 0 | x^3-2x : $x\geq 0$

$f(-2)=|(-2)^2-4|$

$=|4-4|=\boxed{0}$

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

$=8-4$

$=\boxed{4}$

$f(0)=0^3-2(0)$

$=\boxed{0}$

$$f(x)=\frac{x-5}{x^2-4}$$

Find

$f(5)=\frac{5-5}{5^2-4}=\frac{0}{21}=\boxed{0}$

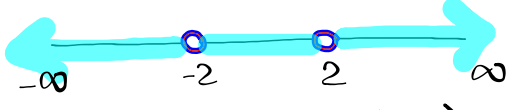
$f(0)=\frac{0-5}{0-4}=\boxed{\frac{5}{4}}$

$f(2)=\frac{2-5}{2^2-4}=\frac{-3}{0}$ undefined

$f(-2)=\frac{-2-5}{(-2)^2-4}=\frac{-7}{0}$ undefined

Discuss domain

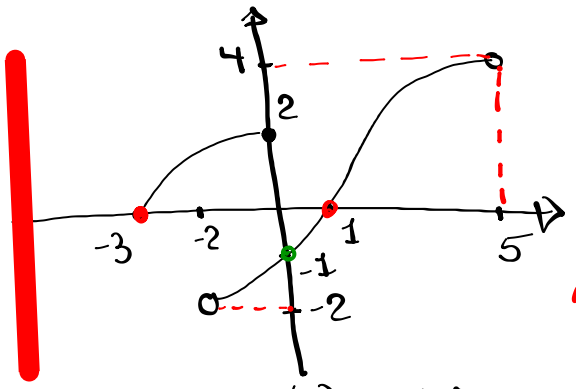
$f(x)=\frac{x-5}{x^2-4}$ $\quad x^2-4\neq 0$ $\quad x^2\neq 4$ $\quad x\neq\pm 2$



Interval notations → $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$

Union OR

Consider graph below



Domain $[-3, 5)$

Range $(-2, 4)$

All intercepts

x-Int: $(-3, 0), (1, 0)$

Y-Int: $(0, -1), (0, 2)$

SG 4 ✓

Function or not? explain

Not a function, by V.L.T.

Class QZ 10

$f(x) = x^2 - 3x + 9$ $\quad$ $g(x) = x - 3$

Find

$f(-2) = (-2)^2 - 3(-2) + 9$

$= 4 + 6 + 9 = \boxed{19}$

$g(3) = 3 - 3$

$= \boxed{0}$

$(f \cdot g)(x) = f(x) \cdot g(x) = (x^2 - 3x + 9)(x - 3)$

$= x^3 - 3x^2 - 3x^2 + 9x + 9x - 27$

$= \boxed{x^3 - 6x^2 + 18x - 27}$