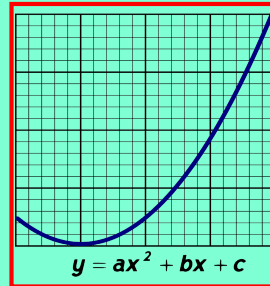


Math 125  
Fall 2021  
Lecture 16



Class QZ 11

Solve  $|5x + 10| = 20$

$$5x + 10 = 20$$

$$5x = 10$$

$$x = 2$$

OR  $5x + 10 = -20$

$$5x = -30$$

$$x = -6$$

Solution  
Set

$$\{-6, 2\}$$

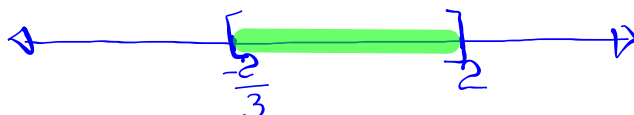
Solve  $|3x-2| \leq 4$  shade between  
 ↑ inequality

Solve  $|3x-2|=4$

$$3x-2=4 \quad \text{OR} \quad 3x-2=-4$$

$$3x=6 \quad \quad \quad 3x=-2$$

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



S.B.N.  $\{x \mid -\frac{2}{3} \leq x \leq 2\}$

I.N.  $[-\frac{2}{3}, 2]$

Solve  $|2x+9|-3 \geq 6$

Isolate Abs. Value  $|2x+9| \geq 6+3$   
 $|2x+9| \geq 9$

Solve  $|2x+9|=9$

$$2x+9=9$$

$$2x=0$$

$$\boxed{x=0}$$

$$2x+9=-9$$

$$2x=-18$$

$$\boxed{x=-9}$$

↖ shade Outside



S.B.N.  $\{x \mid x \leq -9 \text{ OR } x \geq 0\}$

I.N.  $(-\infty, -9] \cup [0, \infty)$

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

Always isolate the abs. Value.

move +3 to other side, and Simplify

$$-2|x+5| > -5-3 \quad -2|x+5| > -8$$

Divide by -2, and  
Simplify

$$\frac{-2}{-2}|x+5| < \frac{-8}{-2}$$

$$|x+5| < 4$$

Solve  $|x+5|=4$

$$x+5=4$$

$$x=-1$$

$$x+5=-4$$

$$x=-9$$

Shade  
between

S.B.N.  $\{x | -9 < x < -1\}$

I.N.  $(-9, -1)$

Solve  $-3|2x-1|+5 < -4$

Isolate Abs.  
Value First.

$$-3|2x-1| < -4-5$$

$$-3|2x-1| < -9$$

Divide by -3

$$\frac{-3}{-3}|2x-1| > \frac{-9}{-3}$$

$$|2x-1| > 3$$

Solve  $|2x-1|=3$

$$2x-1=3$$

$$2x=4$$

$$x=2$$

$$2x-1=-3$$

$$2x=-2$$

$$x=-1$$

Shade  
outside

S.B.N.  $\{x | x < -1 \text{ OR } x > 2\}$

I.N.  $(-\infty, -1) \cup (2, \infty)$

Solve  $|2x + 7| = |x - 8|$

$$2x + 7 = x - 8$$

$$2x - x = -8 - 7$$

$$\boxed{x = -15}$$

$$\rightarrow \{-15, \frac{1}{3}\}$$

OR  $2x + 7 = -(x - 8)$

$$2x + 7 = -x + 8$$

$$2x + x = 8 - 7$$

$$3x = 1$$

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

Solve  $|3x + 6| = |3x - 6|$

$$3x + 6 = 3x - 6$$

$$3x - 3x = -6 - 6$$

$$0 = -12$$

False

No solution

$$\rightarrow \{0\}$$

$$|5| = |5|$$

$$|5| = |-5|$$

OR  $3x + 6 = -(3x - 6)$

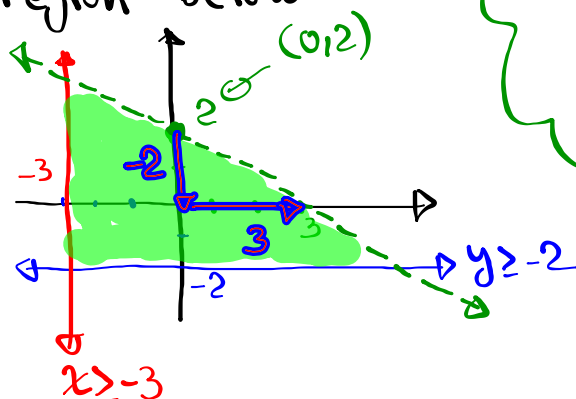
$$3x + 6 = -3x + 6$$

$$3x + 3x = 6 - 6$$

$$6x = 0$$

$$x = \frac{0}{6} \quad \boxed{x = 0}$$

Consider the Shaded  
Region below



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

$$f(x) = x + 4$$

$$g(x) = x^2 - 4x + 16$$

Find

$$\begin{aligned} f+g &= f(x) + g(x) \\ &= x+4 + x^2 - 4x + 16 \\ &= \boxed{x^2 - 3x + 20} \end{aligned}$$

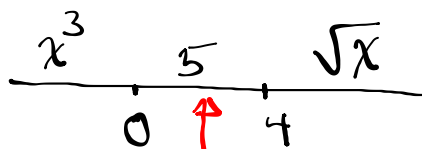
$$\begin{aligned} f-g &= f(x) - g(x) \\ &= x+4 - (x^2 - 4x + 16) \\ &= x+4 - x^2 + 4x - 16 \\ &= \boxed{-x^2 + 5x - 12} \end{aligned}$$

$$\begin{aligned} f \cdot g &= f(x) \cdot g(x) \\ &= (x+4)(x^2 - 4x + 16) \\ &= x^3 - 4x^2 + 16x + 4x^2 - 16x + 64 \\ &= \boxed{x^3 + 64} \end{aligned}$$

$$\begin{aligned} g/f &= \frac{g(x)}{f(x)} ; f(x) \neq 0 \\ &= \frac{x^2 - 4x + 16}{x+4} \quad \begin{matrix} x+4 \neq 0 \\ x \neq -4 \end{matrix} \end{aligned}$$

Given

$$f(x) = \begin{cases} x^3 & \text{if } x < 0 \\ 5 & \text{if } 0 \leq x < 4 \\ \sqrt{x} & \text{if } x \geq 4 \end{cases}$$



Find

$$f(-2) = (-2)^3 = \boxed{-8}$$

$$f(0) = \boxed{5}$$

$$f(2) = \boxed{5}$$

$$f(4) = \sqrt{4} = \boxed{2}$$

$$f(100) = \sqrt{100} = \boxed{10}$$

Given  $A(-5, 2)$ 

Find the equation of a line that contains

A

a) with Zero slope

$$\boxed{y=2}$$

Horizontal line  
y-onlyb) with No slope

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

Vertical  
line  
x-onlyc) with undefined slopeVertical line  
x-only

## Special Factoring

$$A^3 + B^3 = (A + B)(A^2 - AB + B^2)$$

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

$$x^3 + 64 =$$

$$x^3 + 4^3 = (x + 4)(x^2 - 4x + 16)$$

$$x^3 + 125 =$$

$$x^3 + 5^3 = (x + 5)(x^2 - 5x + 25)$$

$$A^3 - B^3 = (A - B)(A^2 + AB + B^2)$$

$$x^3 - 5^3 = (x - 5)(x^2 + 5x + 25)$$

$$x^3 - 1000 =$$

$$x^3 - 10^3 = (x - 10)(x^2 + 10x + 100) \quad \text{Hint: } 1000 = 10^3$$

Factor completely:

$$x^4 + 27x = x(x^3 + 27)$$

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

Simplify  $\frac{x^2 + 10x}{x^3 + 1000}$

$$= \frac{x(\cancel{x+10})}{(\cancel{x+10})(x^2 - 10x + 100)}$$

$$= \frac{x}{x^2 - 10x + 100}$$

$\frac{x^2 - 25}{x^3 - 125} = \frac{x^2 - 5^2}{x^3 - 5^3}$   
 $= \frac{(x+5)(\cancel{x-5})}{(\cancel{x-5})(x^2 + 5x + 25)} = \frac{x+5}{x^2 + 5x + 25}$

Simplify  $\frac{1}{2} - \frac{1}{3}$

$$= \frac{1 \cdot 3}{2 \cdot 3} - \frac{1 \cdot 2}{3 \cdot 2} = \frac{3}{6} - \frac{2}{6} = \frac{3-2}{6}$$

$$= \frac{1}{6}$$

Simplify  $\frac{1}{x-2} - \frac{1}{x+3}$

$$= \frac{1 \cdot (x+3)}{(x-2)(x+3)} - \frac{1 \cdot (x-2)}{(x+3)(x-2)}$$

$$= \frac{1(x+3) - 1(x-2)}{(x-2)(x+3)} = \frac{\cancel{x}+3 - \cancel{x}+2}{(x-2)(x+3)}$$

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



Class QZ 12

Solve  $|3x - 5| = |-2x + 10|$

$$3x - 5 = -2x + 10 \quad \text{OR} \quad 3x - 5 = -(-2x + 10)$$

$$3x + 2x = 10 + 5$$

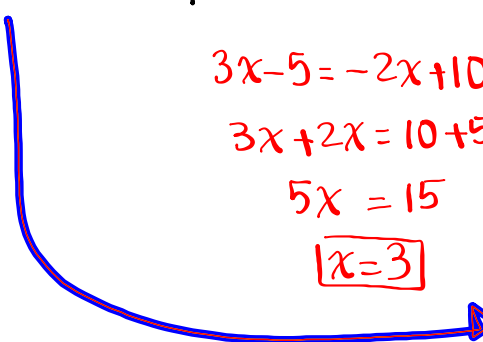
$$5x = 15$$

$$\boxed{x = 3}$$

$$3x - 5 = 2x - 10$$

$$3x - 2x = -10 + 5$$

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


$$\{-5, 3\}$$