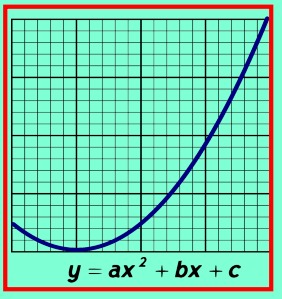
Math 125

Spring 2021

Lecture 5



Class QZ 4

$f(x) = x^2 - 4x$ Find

Box Your Final Ans.

1) $f(0) = 0^2 - 4(0)$
$= 0 - 0$
$= \boxed{0}$

2) $f(4) = (4)^2 - 4(4)$
$= 16 - 16$
$= \boxed{0}$

3) $f(-4) = (-4)^2 - 4(-4)$
$= 16 + 16$
$= \boxed{32}$

4) $f(x+2) = (x+2)^2 - 4(x+2)$
$= (x+2)(x+2) - 4(x+2)$
$= x^2 + 2x + 2x + 4 - 4x - 8$
$= \boxed{x^2 - 4}$

1) Page-Per-Page Contents.
Use Clear Paper

2) Portrait Style only. ✓ ☒

3) One file only.
Pages must be in order.

Operations with Functions:

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

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

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

4) Division $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$; $g(x) \neq 0$

5) Composition $(f \circ g)(x) = f(g(x))$

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

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

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

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

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

$= x+4 - x + 4 = \boxed{8}$

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

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

$= x^2 - 4x + 4x - 16 = \boxed{x^2-16}$

4) Find $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x+4}{x-4}$ $x-4 \neq 0$

$\boxed{x \neq 4}$

5) Find $(f \circ g)(x) = f(g(x))$

Composition

$= g(x) + 4$

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

Given $f(x) = 2x + 5$ & $g(x) = x - 3$

Find

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

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

$= 2x + 5 + x - 3$

$= \boxed{3x + 2}$

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

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

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

$= 2x + 5 - x + 3$

$= \boxed{x + 8}$

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

$f(x) \cdot g(x) = (2x + 5)(x - 3)$

$= 2x^2 - 6x + 5x - 15$

$= \boxed{2x^2 - x - 15}$

4) Find $\left(\frac{g}{f}\right)(x) = \frac{g(x)}{f(x)}$

$= \frac{x-3}{2x+5}$ → $2x+5 \neq 0$

$x \neq -\frac{5}{2}$

5) Find $(f \circ g)(x) = f(g(x))$

$= 2(g(x)) + 5$ (where $x = g(x)$)

$= 2(x-3) + 5 = 2x - 6 + 5$

$= \boxed{2x-1}$

Consider the chart below

x	-1	0	2	3
$f(x)$	2	-1	0	3
$g(x)$	0	3	-1	2

$f(-1) = 2$

$f(2) = 0$

$g(0) = 3$

$g(-1) = 0$

Find $(f+g)(0) =$

$f(0) + g(0) = -1 + 3 = \boxed{2}$

Find $(f-g)(2) = f(2) - g(2) = 0 - (-1) = \boxed{1}$

Find $(f \cdot g)(3) =$

$f(3) \cdot g(3) = 3 \cdot 2 = 6$

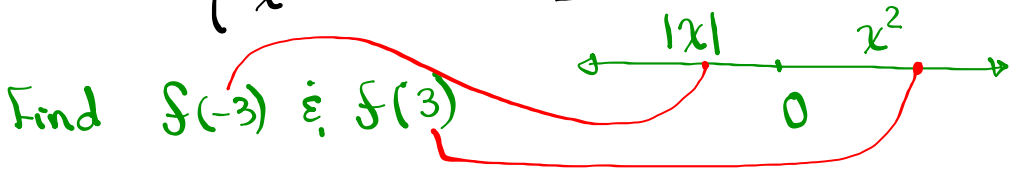
Find $\left(\frac{f}{g}\right)(-1) = \frac{f(-1)}{g(-1)} = \frac{2}{0}$ undefined

Find $(f \circ g)(2) = f(g(2))$

$= f(-1) = 2$

Piece-wise Functions

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



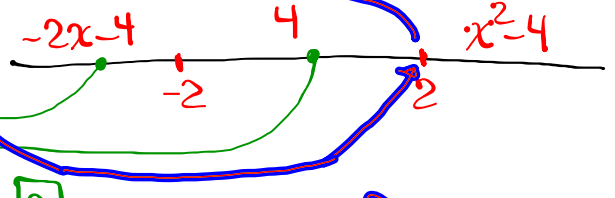
Find $f(-3)$ & $f(3)$

$f(-3) = |-3| = 3$

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

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

Find $f(-3), f(0), f(2)$



$f(-3) = -2(-3) - 4 = 6 - 4 = \boxed{2}$

$f(0) = \boxed{4}$

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

$= \boxed{0}$

$f(x) = \frac{x-8}{x+4}$ Find

1) $f(0) = \frac{0-8}{0+4} = \frac{-8}{4} = \boxed{-2}$

2) $f(-3) = \frac{-3-8}{-3+4} = \frac{-11}{1.} = \boxed{-11}$

3) $f(-5) = \frac{-5-8}{-5+4} = \frac{-13}{-1} = \boxed{13}$

4) $f(8) = \frac{8-8}{8+4} = \frac{0}{12} = \boxed{0}$

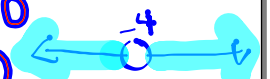
5) $f(-4) = \frac{-4-8}{-4+4} = \frac{-12}{0}$ undefined.

6) Discuss domain

Deno. $\neq 0$

$x+4 \neq 0$

$x \neq -4$



$(-\infty,-4) \cup (-4,\infty)$

Factor Completely

$2x^2 + 5x - 7 = (2x - 1)(x + 7)$

$= (2x + 7)(x - 1)$

Simplify

$$\frac{(x^3)^4 \cdot (x^5)^2}{x^5 \cdot x^4 \cdot x^1} = \frac{x^{12} \cdot x^{10}}{x^{10}} = \frac{x^{22}}{x^{10}} = x^{22-10} = x^{12}$$

Exponential Rules

$x^m \cdot x^n = x^{m+n}$

$(x^m)^n = x^{m \cdot n}$

$\frac{x^m}{x^n} = x^{m-n}$

SG 3

Link for SG 3 ✓

New SG now available.

Solving inequalities:

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

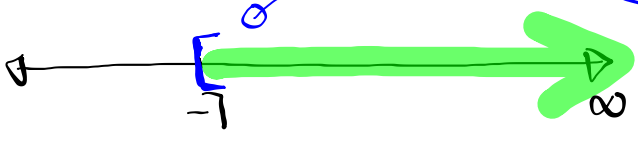
$2x - 4x \leq 6 + 8$

$-2x \leq 14$

→ Divide by -2

$\frac{-2}{-2}x \geq \frac{14}{-2}$

$x \geq -7$



Such that

Set-Builder Notation $\{x \mid x \geq -7\}$

Interval Notation $[-7, \infty)$

Solve $2(x-3)+8 > 4(x+2)-10$

$2x-6+8 > 4x+8-10$

Simplify both sides first.

$2x+2 > 4x-2$

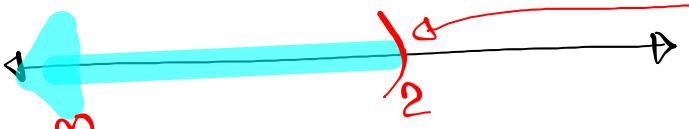
$2x-4x > -2-2$

$-2x > -4$

Divide by -2

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

$x < 2$



Interval Notation $(-\infty, 2)$

S.B.N. $\{x \mid x < 2\}$

Solve $-1 < 2x-3 \leq 7$

Isolate x in the middle.

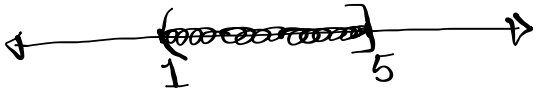
Add 3 to all sides and simplify

$-1+3 < 2x-3+3 \leq 7+3$

$2 < 2x \leq 10$

Divide all sides by 2

$\frac{2}{2} < \frac{2}{2}x \leq \frac{10}{2} \Rightarrow 1 < x \leq 5$



I.N. $(1, 5]$

S.B.N. $\{x \mid 1 < x \leq 5\}$

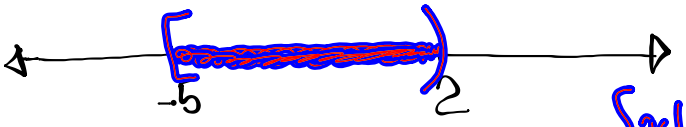
Solve $-4 < -3x + 2 \leq 17$

Subtract 2

$-6 < -3x \leq 15$

Divide by -3

$2 > x \geq -5 \Leftrightarrow \boxed{-5 \leq x < 2}$



I.N. $[-5, 2)$ S.B.N. $\{x \mid -5 \leq x < 2\}$

Introduction to Sets:

Sets are collection of objects.

$\{$Trump, Obama, Bush$\}$

$\{$Mike, Mary, Moe, Melody$\}$

$\{1, 3, 5, 7, \ldots\}$

infinite set of odd integers

$\{\ldots, -4, -2, 0, 2, 4, 6, \ldots\}$

infinite set of even integers

Operations with Sets:

1) Union $\Leftrightarrow \cup$

$A \cup B$ means elemenents of A and B all put in a new Set. Do not duplicate Common elements.

2) Intersection $\Leftrightarrow \cap$

$A \cap B$ means only the Common elements put in a new Set.

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

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

$= \{1,2,3,4,\ldots,8,9\}$

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

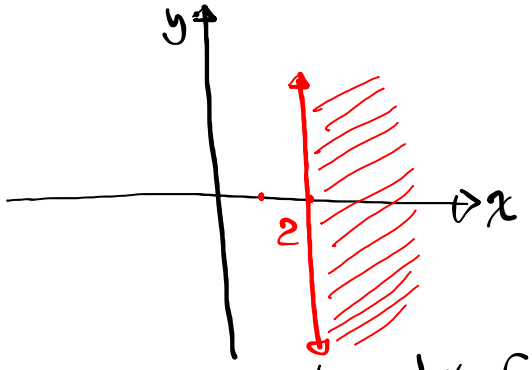
$A = \{2,4,6,8\}$ $B = \{1,3,5,7,9\}$

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

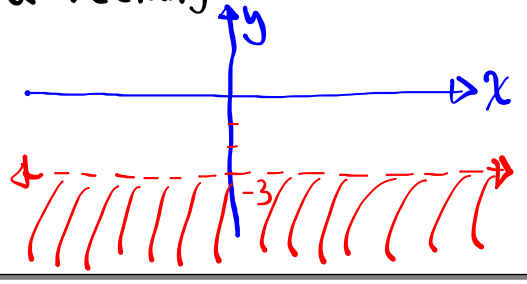
$A \cap B = \phi = \{\}$

$\{\phi\}$ WRONG empty Set

Graph $x \geq 2$ in a rectangular Coordinate System.



Graph $y < -3$ in a rectangular Coordinate System.



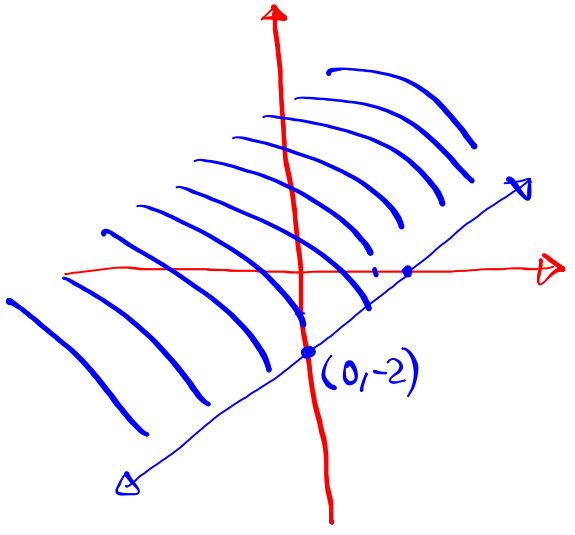
Graph & shade

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

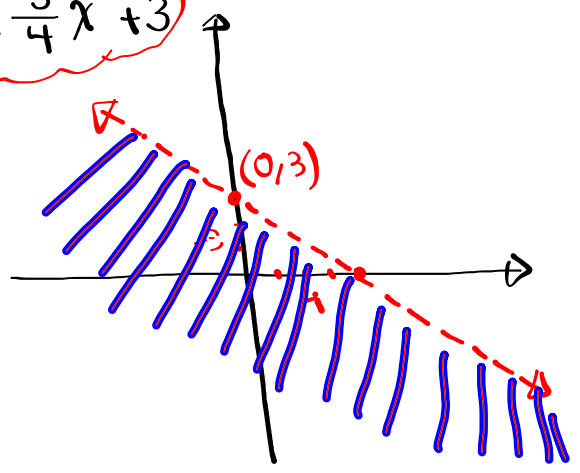
Slope-Int. Form

Y-Int $(0,-2)$

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



Graph & Shade $y < \frac{-3}{4}x + 3$



Slope-Int Form

Y-Int $(0,3)$

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

Graph & Shade $5x - 3y \leq 9$

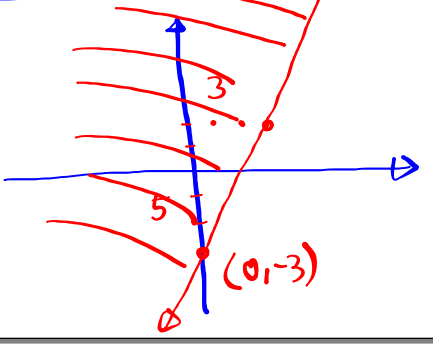
Hint: Write in Slope-Int. Form

$-3y \leq -5x + 9$

Divide by -3

$\frac{-3}{-3}y \geq \frac{-5}{-3}x + \frac{9}{-3}$

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



Y-Int $(0,-3)$

Slope $m = \frac{5}{3}$

Solid, Shade above

Class Qiz 5

① Simplify: $(3x-7)(3x+7)$

② Simplify: $\dfrac{(x^3)^3}{(x^4)^2}$

③ Solve:
$(x-8)(x+6)=0$