

Today's Plan:

Learning Target (standard): I will perform operations on functions and determine the domain and range of the resulting function.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

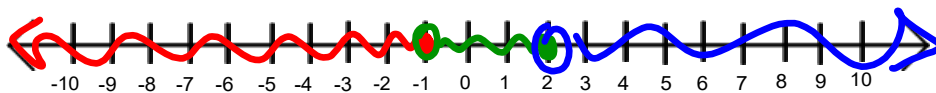
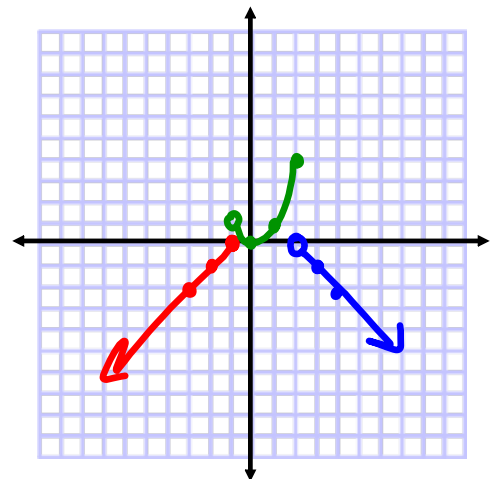
Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Graph and find the domain and range:

$$f(x) = \begin{cases} x+1, & x \leq -1 \\ x^2, & -1 < x \leq 2 \\ -x+2, & 2 < x \end{cases}$$

$$D: \mathbb{R}$$

$$R: \{y \mid y \leq 4\}$$



Find the domain:

$$f(x) = \frac{x}{|2x-7|}$$

$$2x-7=0$$

$$2x=7$$

$$x = \frac{7}{2}$$

$$\mathbb{D}: \left\{ x \mid x \neq \frac{7}{2} \right\}$$

Find the domain:

$$f(x) = \frac{\sqrt{x+1}}{x-2}$$

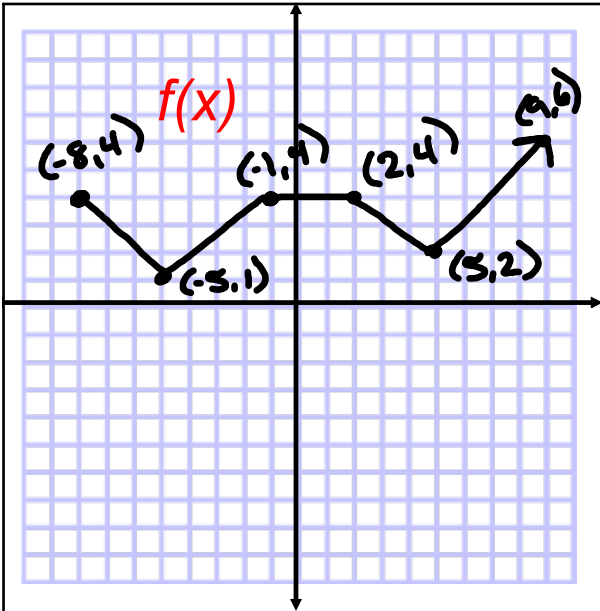
$$x+1 \geq 0$$

$$x \geq -1$$

$$x-2=0$$

$$x=2$$

$$\mathbb{D}: \left\{ x \mid x \geq -1, x \neq 2 \right\}$$



D: $\{x \mid x \geq -8\}$

R: $\{y \mid y \geq 1\}$

Increasing: $(-5, 1), (5, \infty)$

Decreasing: $(-8, -5), (2, 5)$

Constant: $(-1, 2)$

Graph and find domain and range:

$$y = -\frac{1}{2} \left| \frac{1}{2}x + 2 \right| - 3$$

parent: $y = |x|$

1) $y = -|x|$ r.x

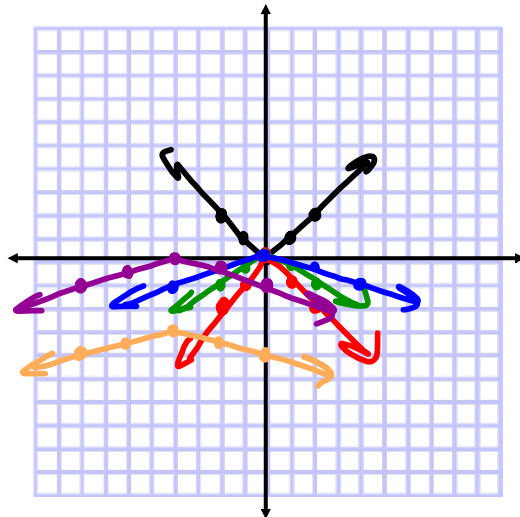
2) $y = -\frac{1}{2}|x|$ v.c. by $\frac{1}{2}$

3) $y = -\frac{1}{2}|\frac{1}{2}x|$ h.s. by 2

4) $y = -\frac{1}{2}|\frac{1}{2}(x+4)|$ shift left 4

5) $y = -\frac{1}{2}|\frac{1}{2}x + 2| - 3$ shift down 3

D: \mathbb{R}
R: $\{y \mid y \leq -3\}$



Operations on Functions: $f(x), g(x)$

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

"operation" "notation"

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

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

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

Domain of these Operations:

- find the domain of each of the original functions given
- find the intersection of the domains of those functions given
- find the domain of the resulting function
- The domain of the **new** function is the intersection of each of these

Find each of the following and the domain:

$$f(x) = \sqrt{x+2} \quad \begin{matrix} x+2 \geq 0 \\ x \geq -2 \end{matrix} \quad g(x) = \sqrt{3-x} \quad \begin{matrix} 3-x \geq 0 \\ -x \geq -3 \\ x \leq 3 \end{matrix}$$

$$D_f: \{x \mid x \geq -2\}$$

$$D_g: \{x \mid x \leq 3\}$$

$$D_{f \cap g}: \{x \mid -2 \leq x \leq 3\}$$

$$a) (f+g)(x) = \sqrt{x+2} + \sqrt{3-x}$$

$$D_{f+g}: \{x \mid -2 \leq x \leq 3\}$$

$$b) (f-g)(x) = \sqrt{x+2} - \sqrt{3-x}$$

$$D_{f-g}: \{x \mid -2 \leq x \leq 3\}$$

Find each of the following and the domain:

$$f(x) = \sqrt{x+2} \quad g(x) = \sqrt{3-x}$$

$$c) (fg)(x) = \sqrt{x+2} \cdot \sqrt{3-x}$$

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

$$D_{fg}: \{x \mid -2 \leq x \leq 3\}$$

$$(fg)(x) = \sqrt{-x^2+x+6}$$

$$d) \left(\frac{f}{g}\right)(x) = \frac{\sqrt{x+2}}{\sqrt{3-x}}$$

$$\left(\frac{f}{g}\right)(x) = \sqrt{\frac{x+2}{3-x}}$$

$$D_{\frac{f}{g}}: \{x \mid -2 \leq x < 3\}$$

Composite Functions and Domain: $f(g(x)) = (f \circ g)(x)$

- find the domain of the function that the other is being evaluated at
- find the domain of the composite function
- the domain of the **final** composite function is the intersection of the above-mentioned

Find each of the following and the domain:

$$f(x) = \frac{x}{x-1} \quad g(x) = \frac{-4}{x} \quad D_g: \{x \mid x \neq 0\}$$

$$(f \circ g)(x) = f(g(x)) = \frac{\frac{-4}{x}}{\frac{-4}{x} - 1}$$

$$= \frac{-\frac{4}{x}}{\frac{-4}{x} - \frac{x}{x}}$$

$$= \frac{-\frac{4}{x}}{\frac{-4-x}{x}}$$

$$= -\frac{4}{x} \cdot \frac{x}{-4-x}$$

$$= \frac{-4}{-4-x}$$

$$(f \circ g)(x) = \frac{4}{x+4}$$

$$D_{f \circ g}: \{x \mid x \neq -4, 0\}$$

both "new" and $g(x)$ since it is the one being substituted into $f(x)$

Assignment:

p.158 #8,16,26,32,38,42