1.1 Answer Key

Practice 1-1-1:

Determine whether the relation is a function.

a) {(a,b), (c,d), (a,c)}

No, it is **NOT** a function because every x-value corresponds to **more than one** y-value. In this case, when x = a, y = b, and c. Let's use a menu as an example: if you and your friend made the same order, but you are charged more than your friend for no reason, does that make sense? No, therefore, it is not a function.

b) {(a,b), (b,c), (c,c)}

Yes, it is a function because every x-value corresponds to **only one** y-value. In this case, when x = b, y = c, and when x = c, y = c. Let's use a menu as an example: on the menu, Coke and Sprite are the same price. Is this possible? Can this happen? Yes, therefore, it is a function.

Practice 1-2-1:

Evaluate a function given by an algebraic expression.

Find $f(-5)$ if $f(x) = -3x^2 + 6$

Step 1: Use parentheses to substitute all x-values in the given function.

- $f(\;) = -3(\;\;)^2 + 6$

Step 2: Identify the new x-value.

- New $x = -5$, since $f(x)$ is rewritten as $f(-5)$

Step 3: Substitute the new x-value inside the parentheses.

- $f(-5) = -3(-5)^2 + 6$

Step 4: Solve the equation.

- $f(-5) = -3(-5)^2 + 6$ (order of operation, PEMDAS)
- $f(-5) = -3(25) + 6$

- $f(-5) = -75 + 6$
- $f(-5) = -69$

Answer: -69

Practice 1-2-2:

Evaluate a function given by an algebraic expression.

Find $f(3)$ if $f(x) = 2x^2 - 3x + 9$

Step 1: Use parentheses to substitute all x-values in the given function.

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

Step 2: Identify the new x-value.

- $x = 3$

Step 3: Substitute the new x-value inside the parentheses.

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

Step 4: Solve the equation.

- $f(3) = 2(3)^2 - 3(3) + 9$ (Order of operation, PEMDAS.)
- $f(3) = 2(9) - 3(3) + 9$
- $f(3) = 18 - 9 + 9$
- $f(3) = 18$

Answer: 18

Practice 1-3-1:

Find the domain of the following functions, then use set builder notation and interval notation represent its domain.

- $F(x) = \sqrt{5x - 7}$

Step 1: Start with a domain of "all real numbers".

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? No, then skip.
- Do I see $\sqrt{a}$? Yes.
- Then $a \geq 0$

only use $5x - 7$, since the restriction says $a \geq 0$, and a is the variable that under the even root.

☞ $5x - 7 \geq 0$ (Add 7 on both sides of the equal sign.)

$5x \geq 7$ (Divide 3 on both sides of the equal sign.)

$$x \geq \frac{7}{5}$$

- Overall, $x \geq \frac{7}{5}$

Answer:

Set builder notation: $\{x|x \geq \frac{7}{5}\}$

Interval notation: $(\frac{7}{5}, \infty)$

Thinking:

Can I use $\frac{7}{5} \leq x$? - Yes.
If so, then the answer you have would be
Set builder notation: $\{x|\frac{7}{5} \leq x\}$
Interval notation: $(\frac{7}{5}, \infty)$
In math, we normally put x in the left, and then decide what sign to use, thus, it is important to know how to identity and read the inequality sign. My citizens, you can find inequality sign table in Recapture section – Tips/Key Review.

Practice 1-3-2:

Find the domain of the following functions, then use set builder notation and interval notation represent its domain.

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

Step 1: Start with a domain of "all real numbers".

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? Yes
- Then $a \neq 0$
- $x + 3 \neq 0$ (Subtract 3 on both sides of the equal sign.)
- $x \neq -3$

- Do I see $\sqrt{a}$? No, then skip.

- Overall, $x \neq -3$

Answer:

Set builder notation: $\{\boldsymbol{x} | \boldsymbol{x} \neq -3\}$

Interval notation: $(-\infty, \mathbf{-3})(\mathbf{-3}, \infty)$

Practice 1-3-3:

Find the domain of the following functions, then use set builder notation and interval notation represent its domain.

- $F(x) = \frac{\sqrt{2x}}{x-5}$

Set builder notation: ___________________.

Interval notation: ___________________.

Step 1: Start with a domain of “all real numbers”.

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? Yes
- Then $a \neq 0$
- $x - 5 \neq 0$ (Add 5 on both sides of the equal sign.)
- $x \neq 5$
- Do I see $\sqrt{a}$? Yes.
- Then $a \geq 0$

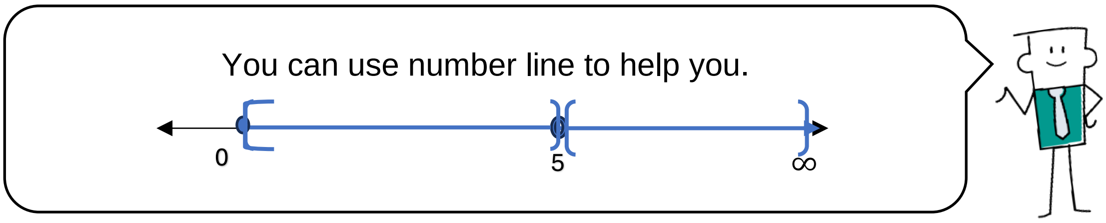
  $2x \geq 0$ (Divide 3 on both sides of the equal sign.)

  $x \geq 0$
- Overall, $x \neq 5$ and $x \geq 0$.

Answer:

Set builder notation: $\{\boldsymbol{x} | \boldsymbol{x} \geq \mathbf{0}$ **and** $\boldsymbol{x} \neq \mathbf{5}\ \}$

Interval notation: $[\mathbf{0}, \mathbf{5}), (\mathbf{5}, \infty)$



Practice 1-4-1:

Given functions $f(x) = 2x - 1; g(x) = x - 3$

Find $(f - g)(x)$ and its domain.

1) Identify what is the operation between two functions are add, subtracting, multiplying or dividing.

   Subtraction: use –

2) Write two functions and use required operation you found in step 1.
   - $f(x) - g(x) = (2x - 1) - (x - 3)$

3) Solve and simplify.
   - $f(x) - g(x) = (2x - 1) - (x - 3)$
   - $f(x) - g(x) = 2x - 1 - x + 3$
   - $f(x) - g(x) = x + 2$

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

Domain:

Check domain for $f(x) = 2x - 1$

Step 1: Start with a domain of “all real numbers”.

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? No, then skip.
- Do I see $\sqrt{a}$? No, then skip.
- Overall, no restrictions apply.
- Thus, domain x is all real numbers

Check domain for $g(x) = x - 3$

Step 1: Start with a domain of “all real numbers”.

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? No, then skip.
- Do I see $\sqrt{a}$? No, then skip.
- Overall, no restrictions apply.
- Thus, domain x is all real numbers

Common domains of f and g are all real numbers.

Answer:

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

Domain:

Set builder notation: $\{x|x \in \mathbb{R}\}$

Interval notation: $(-\infty, \infty)$

Practice 1-4-2:

Given functions $f(x) = 2x - 1; g(x) = x - 3$

Find $\left(\frac{f}{g}\right)(x)$ and its domain.

1) Identify what is the operation between two functions are add, subtracting, multiplying or dividing.

   Dividing: use ÷

2) Write two functions and use required operation you found in step 1.

$$\frac{f(x)}{g(x)} = \frac{(2x-1)}{(x-3)}$$

3) Solve and simplify.

- $\frac{f(x)}{g(x)} = \frac{(2x-1)}{(x-3)}$ (no common divisor or factors, thus this is the simplest form).
- $\frac{f(x)}{g(x)} = \frac{2x-1}{x-3}$

Domain:

Check domain for $f(x) = 2x - 1$

Step 1: Start with a domain of "all real numbers".

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? No, then skip.
- Do I see $\sqrt{a}$? No, then skip.
- Overall, no restrictions apply.
- Thus, domain x is all real numbers

Check domain for $g(x) = x - 3$

Step 1: Start with a domain of “all real numbers”.

Step 2: Look for restrictions.

- Do I see $\frac{b}{a}$? No, then skip.
- Do I see $\sqrt{a}$? No, then skip.
- Overall, no restrictions apply.
- Thus, domain x is all real numbers

Since the domain of $\left(\frac{f}{g}\right)$ is the common domains of f and g AND $g(x) \neq 0$.

We need to include $g(x) \neq 0$.

$g(x) = x - 3$

$x - 3 \neq 0$

$\mathrm{x} \neq 3$

$x \neq 3$

Overall, domains of f and g are all real numbers and $x \neq 3$

Answer:

$\left(\frac{f}{g}\right)(x) = \frac{2x-1}{x-3}$

Domain:

Set builder notation: $\{x|x \neq 3\}$

Interval notation: $(-\infty, 3), (3, \infty)$

Practice 1-4-3:

Given functions $f(x) = 3x^2 - 7; g(x) = x + 3$

Find $(f \cdot g)(-1)$.

- Step 1: Find $f(-1)$
- $f(-1) = 3(-1)^2 - 7$
- $f(-1) = 3(1) - 7$
- $f(-1) = 3 - 7$
- $f(-1) = -4$

- Step 2: Find $g(-1)$
- $g(-1) = -1 + 3$
- $g(-1) = 2$
-
- Step 3: Find $(f \cdot g)(-1)$
- $(f \cdot g)(-1) = f(-1)g(-1)$
- $(f \cdot g)(-1) = (-4)(2)$
- $(f \cdot g)(-1) = -8$

Answer:

- $(f \cdot g)(-1) = -8$