

Student Workbook

Functions & Function Notation

Name: _____

Date: _____

Period: _____

Learning Target: I can determine whether a relation is a function and evaluate functions using function notation.

Vocabulary

Term	Meaning
Relation	Any set of ordered pairs (x, y).
Function	A relation where every input (x) has EXACTLY ONE output (y).
Function Notation	$f(x)$ means "the output of function f when the input is x ." It replaces y .
Vertical Line Test	If any vertical line crosses a graph more than once, the graph is NOT a function.
One-to-One Function	A function where every output also corresponds to exactly one input (passes the horizontal line test too).

Key Concept: What Makes a Relation a Function?

THE RULE

A relation is a function if and only if **every input (x-value) has exactly one output (y-value)**. It's okay for two different x-values to share the same y-value — that does NOT break the function rule.

EXAMPLE 1

Is $\{(1,2), (2,4), (3,6)\}$ a function?

Every x-value (1, 2, 3) appears only once → **yes, this is a function.**

EXAMPLE 2

Is $\{(1,2), (1,3), (2,4)\}$ a function?

The x-value 1 appears twice, paired with two different y-values (2 and 3) → **no, this is NOT a function.**

VERTICAL LINE TEST

For graphs, imagine sliding a vertical line left to right. If it EVER crosses the graph at more than one point at the same time, the graph fails the test and is not a function.

Key Concept: Function Notation

READING $f(x)$

$f(x)$ is read "f of x." It does NOT mean f times x! It just names the output of function f for a given input x.

EXAMPLE 3 — Evaluating a Function

Given $f(x) = 2x^2 - 3x + 1$, find $f(4)$.

$$f(4) = 2(4)^2 - 3(4) + 1 = 2(\underline{\hspace{1cm}}) - \underline{\hspace{1cm}} + 1 = \underline{\hspace{1cm}}$$

EXAMPLE 4 — Evaluating with an Expression

Given $f(x) = x^2 + 2x$, find $f(a + 1)$.

$$f(a+1) = (a+1)^2 + 2(a+1) = a^2 + 2a + 1 + 2a + 2 = \underline{\hspace{2cm}}$$

COMMON MISTAKE

$f(x+2)$ does NOT equal $f(x) + 2$! You must substitute the entire expression " $(x+2)$ " everywhere x appears in the function — you can't just add 2 to the answer at the end.

Guided Practice — Part A: Is It a Function?

A1 $\{(2,5), (3,7), (4,9)\}$

A2 $\{(1,4), (2,4), (3,4)\}$

A3 $\{(0,1), (0,-1), (1,2)\}$

Guided Practice — Part B: Vertical Line Test

B1 A graph is a straight diagonal line. Does it pass the vertical line test?

B2 A graph is a circle. Does it pass the vertical line test?

Guided Practice — Part C: Evaluate the Function

Given $f(x) = 3x^2 - x + 2$, evaluate each:

C1 $f(2)$

C2 $f(-1)$

C3 $f(a)$

C4 $f(x+1)$

Guided Practice — Part D: Apply It

D1 A company's cost to produce x items is modeled by $C(x) = 5x + 200$. Find $C(50)$ and explain what it represents.

BEFORE YOU MOVE ON

Check with a partner: for function evaluation, did you substitute the ENTIRE input expression everywhere the variable appears?