

Function Symmetry Detectives

Use rules, tables, and graphs to classify functions.

HIGH SCHOOL • MA.912.F.1.9

MA.912.F.1.9 "Determine whether a function is even, odd or neither when represented algebraically, graphically or in a table."

NAME _____

DATE _____

TEST THE SYMMETRY

To test an algebraic rule, replace x with $-x$. If $f(-x) = f(x)$, the function is even and has y-axis symmetry; if $f(-x) = -f(x)$, the function is odd and has origin symmetry. If neither comparison is true, the function is neither.

WORKED EXAMPLE

Classify $f(x) = 17x^3 - 23x$ as even, odd, or neither.

1. Replace x with $-x$: $f(-x) = 17(-x)^3 - 23(-x)$.
2. Simplify: $f(-x) = -17x^3 + 23x$.
3. Factor out -1 : $f(-x) = -(17x^3 - 23x) = -f(x)$.

Answer: Odd

PRACTICE 6 problems

- 1** Classify $f(x) = 6x^4 - 2$ as even, odd, or neither.

ANSWER _____

- 2** Classify $g(x) = 5x^5 - 3x$ as even, odd, or neither.

ANSWER _____

- 3** Classify $h(x) = x^3 + 2$ as even, odd, or neither.

ANSWER _____

- 4** Use the table to classify r as even, odd, or neither. x : -3 -1 0 1 3 $r(x)$: 8 2 0 2 8

ANSWER _____

- 5** Use the table to classify s as even, odd, or neither. x : -2 -1 0 1 2 $s(x)$: -8 -1 0 1 8

ANSWER _____

- 6** The graph of q is unchanged when it is reflected across the y-axis. Classify q as even, odd, or neither.

ANSWER _____

APPLY IT Show your work

- 1** A concert-lighting program uses x , the number of steps left or right of center stage, to set a beam's height. For $-4 \leq x \leq 4$, the height is $H(x) = 3x^2 + 5$. Is H even, odd, or neither?

WORK SPACE

ANSWER _____

- 2** A gaming controller maps joystick input x to steering response $R(x)$, as shown. Is R even, odd, or neither? x : -3 -1 0 1 3 $R(x)$: -7 -2 1 4 10

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

For all real x , $p(x) = x^2 + x$ when $x \geq 0$, and $p(x) = x^2 - x$ when $x < 0$. Determine whether p is even, odd, or neither. Explain by comparing $p(-x)$ and $p(x)$.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Classify $f(x) = 6x^4 - 2$ as even, odd, or neither.	Even
2	Classify $g(x) = 5x^5 - 3x$ as even, odd, or neither.	Odd
3	Classify $h(x) = x^3 + 2$ as even, odd, or neither.	Neither
4	Use the table to classify r as even, odd, or neither. x : -3 -1 0 1 3 $r(x)$: 8 2 0 2 8	Even
5	Use the table to classify s as even, odd, or neither. x : -2 -1 0 1 2 $s(x)$: -8 -1 0 1 8	Odd
6	The graph of q is unchanged when it is reflected across the y -axis. Classify q as even, odd, or neither.	Even

PART 2 • APPLY IT

1. **Even** $H(-x) = 3(-x)^2 + 5 = 3x^2 + 5$, so $H(-x) = H(x)$.
2. **Neither** For example, $R(-1) = -2$, while $R(1) = 4$. These values are neither equal nor opposites.

CHALLENGE

Even. For $x > 0$, $p(-x) = (-x)^2 - (-x) = x^2 + x = p(x)$. The same equality holds for $x < 0$ and $x = 0$.

Accept even, odd, or neither in any capitalization. For written explanations, accept a correct comparison of matching positive and negative inputs or a correct calculation using $f(-x)$.