LESSON MAKER PRO

Function Symmetry Check

Classify functions as even, odd, or neither.

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 _____

THE SYMMETRY TEST

Replace x with -x. If f(-x)=f(x), the function is even. If f(-x)=-f(x), the function is odd. On a graph, even functions have y-axis symmetry, and odd functions have origin symmetry.

WORKED EXAMPLE

Determine whether $f(x)=5x^3-9x$ is even, odd, or neither.

1. Find $f(-x)=5(-x)^3-9(-x)$.
2. Simplify: $f(-x)=-5x^3+9x$.
3. Since $-f(x)=-(5x^3-9x)=-5x^3+9x$, $f(-x)=-f(x)$.

Answer: odd

PRACTICE 4 problems

1 Determine whether $f(x)=4x^6-7$ is even, odd, or neither.

ANSWER _____

2 Determine whether $g(x)=x^3+2$ is even, odd, or neither.

ANSWER _____

3 The graph of $y=p(x)$ has origin symmetry. Is p even, odd, or neither?

ANSWER _____

4 Determine whether $q(x)=3x^2/(x^2+4)$ is even, odd, or neither.

ANSWER _____

APPLY IT Show your work

1 The table gives a function h whose domain consists only of the five listed horizontal positions on a ramp. Classify this finite-domain function as even, odd, or neither. Does that establish the symmetry of the entire ramp between the sampled positions?

RAMP PROFILE

x (m)	h(x) (m)
-2	4
-1	1
0	0
1	1
2	4

ANSWER

2 A music app models a sound signal's voltage near the center of a beat by $A(t)=2t^3-6t$, where t is time in seconds before or after the beat. Determine whether A is even, odd, or neither.

WORK SPACE

ANSWER

CHALLENGE One step up

Determine whether $r(x)=(x^3-8x)/(x^2+6)$ is even, odd, or neither. Explain by comparing r(-x) with r(x).

WORK SPACE AND ANSWER

ANSWER KEY

Function Symmetry Check

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Determine whether $f(x)=4x^6-7$ is even, odd, or neither.	**even**
2	Determine whether $g(x)=x^3+2$ is even, odd, or neither.	**neither**
3	The graph of $y=p(x)$ has origin symmetry. Is p even, odd, or neither?	**odd**
4	Determine whether $q(x)=3x^2/(x^2+4)$ is even, odd, or neither.	**even**

PART 2 · APPLY IT

1. **The finite-domain function is even. The table alone does not establish the symmetry of the entire ramp.** The listed domain is symmetric about zero, and each opposite-input pair has equal outputs. Values between those inputs are not specified, so full-ramp symmetry needs more evidence.
2. **odd** $A(-t)=2(-t)^3-6(-t)=-2t^3+6t=-A(t)$.

CHALLENGE

odd, because $r(-x)=((-x)^3-8(-x))/((-x)^2+6)=(-x^3+8x)/(x^2+6)=-(x^3-8x)/(x^2+6)=-r(x)$.

Accept equivalent statements such as "y-axis symmetry" for even and "origin symmetry" for odd when the item asks for a classification. For algebraic explanations, students must correctly compare f(-x) to f(x) or -f(x).