Topic 3.7: Transformations of Polynomial Functions

Essential Question:

How are symmetry and transformations represented in the graph and equation of a polynomial function?

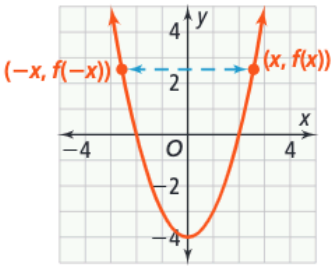
Concept

CONCEPT Odd and Even Functions

A polynomial function $P(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x^1 + a_0$ is an **even function** if it is symmetric about the y-axis and an **odd function** if it is symmetric about the origin.

Other types of functions can also be classified as odd or even. For example, the function $y = |x|$ is an even function.

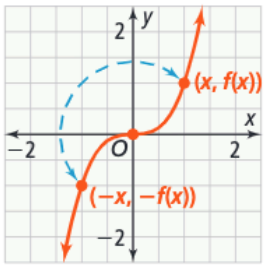
Even Function



For all x in the domain,

$f(x) = f(-x)$.

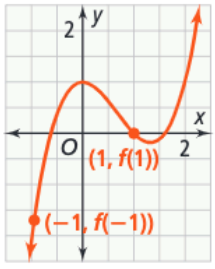
Odd Function



For all x in the domain,

$f(-x) = -f(x)$.

Neither



$f(1) \neq f(-1)$ (not even)

$f(-1) \neq -f(1)$ (not odd)

Q: Are you able to tell if a function is even or odd without seeing the graph?

Q: Can you think of some functions that would not be classified even or odd?

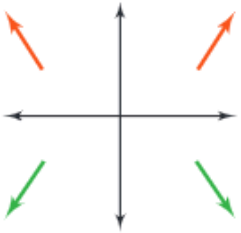
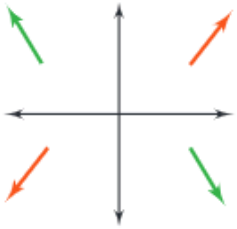
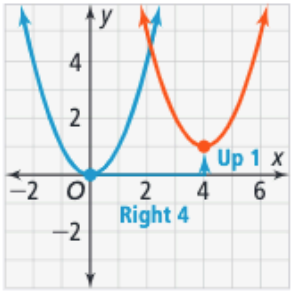
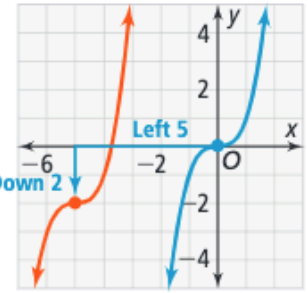
Notes

CONCEPT Summary

Q: What are the properties of even and odd functions?

Concept Summary Assess

CONCEPT SUMMARY Understand Polynomial Functions

	Even Function	Odd Function
DEFINITION	Line of symmetry: y-axis For all x, $f(x) = f(-x)$.	Point of symmetry: origin For all x, $f(-x) = -f(x)$.
PARENT FUNCTION	Has even degree: $y = x^2$, $y = x^4$, $y = x^6$,...	Has odd degree: $y = x$, $y = x^3$, $y = x^5$,...
END BEHAVIOR	(positive leading coefficient) (negative leading coefficient) 	
TRANSLATION	 The vertex moves to the right 4 units and up 1 unit. $y = x^2 \rightarrow y = (x - 4)^2 + 1$	 The graph of the function moves to the left 5 units and down 2 units. $y = x^3 \rightarrow y = (x + 5)^3 - 2$

Examples & Questions

Examples 1

Q: What do you notice about the graphs that can help you identify whether the function is even or odd?

Q: When is it helpful to test points to determine whether a function is odd or even?

Examples 2

Part A

Q: If the highest degree of a function is even, why isn't that enough to say that it is an even function?

Part B

Q: If the highest degree of a function is odd, why isn't that enough to say that it is an odd function?

Examples 3

Part A:

Q: Compare and contrast the two functions shown in the graph.

Part B:

Q: Is the order in which you apply the transformations important?

Q: Why is knowing the graph of the parent function a valuable too?

Examples 4

Part A:

Q: What key features of a graph can you use to determine the transformation of a present function ?

Part B:

Q: What is the end behavior of the graph?

Examples 5

Q: What does it mean to maintain the relationship between width and the other dimensions?

Examples 6

Q: Why is the solution of the inequality the same as the intervals where the graph of $P(x)$ is below the *x-asis*?

Practice and Problem Solving

Complete MathXL for School: Practice and Problem Practice (online)
Complete MathXL for School: Enrichment(online)
Complete MathXL for School: Mixed Review (online)

Challenge: #11, 12, 27 – key will be posted in Power School Learning.

Lesson Quiz 3.7