

FUNCTIONS & GRAPHS

Parent Polynomial Function Behavior



EX #1: $y = c$

 even, y-axis constant, no zeros

EX #2: $y = x$

 odd, origin increases, 1 real zero
 $\lim_{x \rightarrow -\infty} y = -\infty$
 $\lim_{x \rightarrow \infty} y = \infty$

EX #3: $y = x^2$

 even, y-axis
 1 real zero
 $\lim_{x \rightarrow -\infty} y = +\infty$
 $\lim_{x \rightarrow \infty} y = +\infty$

EX #4: $y = x^3$

 odd, origin
 1 real zero
 $\lim_{x \rightarrow -\infty} y = -\infty$
 $\lim_{x \rightarrow \infty} y = \infty$

EX #5: $y = x^4$

 even, y-axis
 1 real zero
 $\lim_{x \rightarrow -\infty} y = +\infty$
 $\lim_{x \rightarrow \infty} y = +\infty$

EX #6: $y = x^4$

 even, y-axis
 1 real zero
 $\lim_{x \rightarrow -\infty} y = +\infty$
 $\lim_{x \rightarrow \infty} y = +\infty$

EX #7: $y = x^4 + \dots$

 even, neither
 4 real zeros

EX #8: $y = x^5$

 odd, origin
 1 real zero
 $\lim_{x \rightarrow -\infty} y = -\infty$
 $\lim_{x \rightarrow \infty} y = \infty$

EX #9: $y = x^5 + \dots$

 odd, neither
 5 real zeros

EX #10: Can you tell? odd
 $y = x^3 - x$
 $0 = x(x^2 - 1)$
 $x = 0, \pm 1$

 3 real zeros

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Foldable

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Parent Polynomial Function Behavior

This is a FREE lesson in the unit on *Functions and Graphs* for students enrolled in PreCalculus. The lesson includes a fully-editable Smart Notebook lesson and a four-page Folded Book style Foldable[®] inspired by the work of Dinah Zike.

You might be interested in my [Activities and Assessments Bundle](#) for Functions and Graphs.

The SMART Board lesson can be used in many ways. Teachers can display the presentation using the following:

1. SMART Board[®]
2. Airliner Wireless Slate[®]
3. [SMART Notebook for IPAD App](#)
4. Through the SMART Notebook Express[®]
<http://express.smarttech.com/#>
5. Promethean Boards[®]
6. Other APPS available for tablets

PARENT POLYNOMIAL FUNCTION BEHAVIOR

Analyze each polynomial function by the following characteristics:

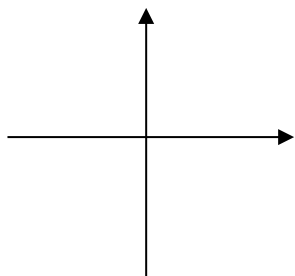
1. even/odd/neither
2. axis of symmetry
3. end behavior
4. possible number of real zeros

Write a summary about your discoveries:

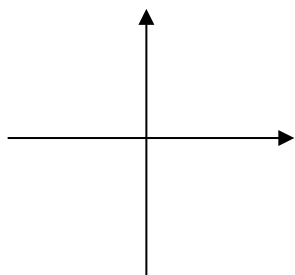


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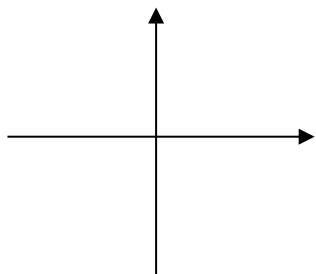
EX #1: $y = c$



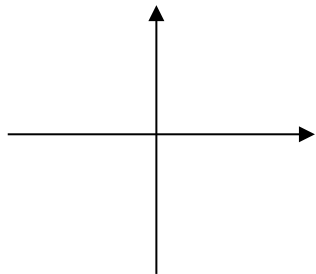
EX #2: $y = x$



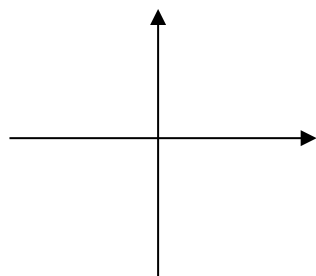
EX #3: $y = x^2$



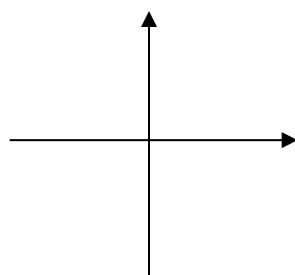
EX #4: $y = x^3$



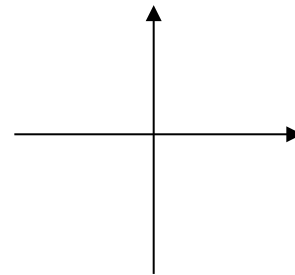
EX #5: $y = x^3 + \dots$



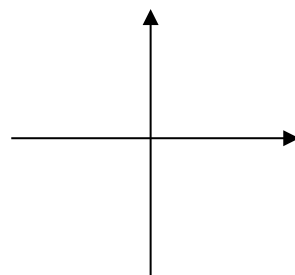
EX #6: $y = x^4$



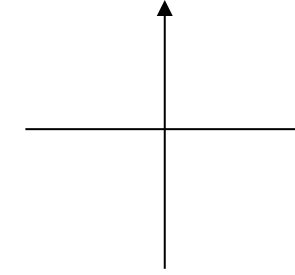
EX #7: $y = x^4 + \dots$



EX #8: $y = x^5$

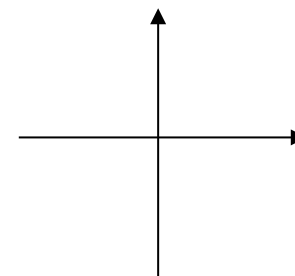


EX #9: $y = x^5 + \dots$



EX #10: Can you tell?

$y = x^3 - x$



Parent Polynomial Function Behavior

Lesson objectives

Students should be familiar with behavior of polynomial functions from previous courses as they relate to symmetry, end-behavior, degree, and even or odd properties. This lesson is a summary of those characteristics.

1.1

Lesson objectives

Teachers' notes

Lesson notes

Parent Polynomial Function Behavior

Analyze each polynomial function by the following characteristics:

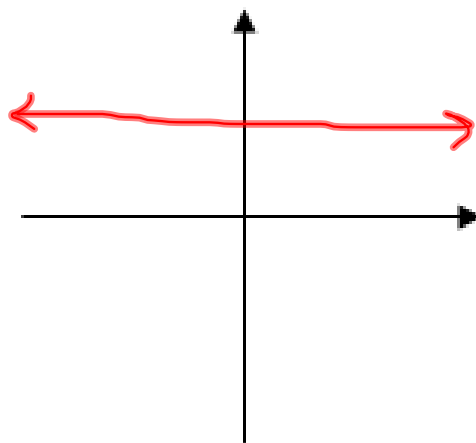
1. even/odd/neither
2. axis of symmetry
3. end behavior
4. possible number of real zeros

Write a summary about your discoveries:

1. odd exponents have origin symmetry
2. even exponents have y-axis symmetry
3. odd exponents fall toward the left and rise toward the right, but even exponents rise on both left and right.
4. When you add other terms the parent graph is transformed and loses its symmetry.
5. The power of the highest degree indicates the potential number of real zeros that could occur.

EX #1: $y = c$

even
y-axis
constant
no zeros



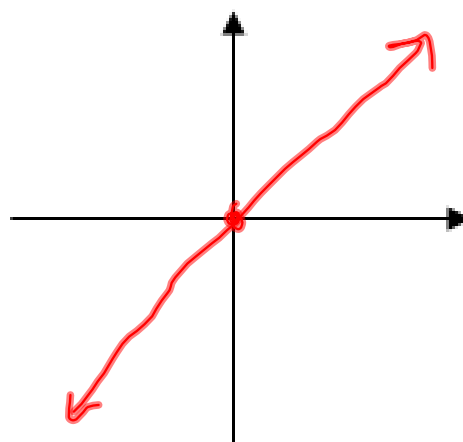
EX #2: $y = x$

odd
origin
increases

$$\lim_{x \rightarrow -\infty} y = -\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

1 real zero



falls left, rises right

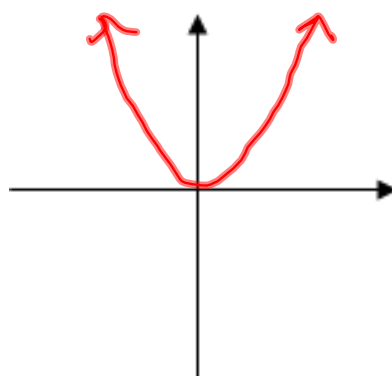
EX #3: $y = x^2$

even
y-axis

$$\lim_{x \rightarrow -\infty} y = +\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

1 real zero



risers left & right

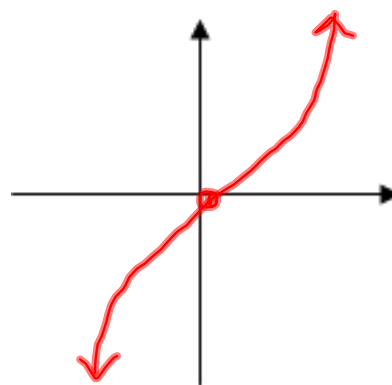
EX #4: $y = x^3$

odd
origin

$$\lim_{x \rightarrow -\infty} y = -\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

1 real zero



falls left
rises right

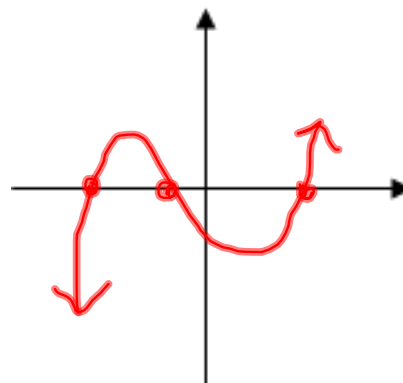
EX #5: $y = x^3 + \dots$

odd
neither*

$$\lim_{x \rightarrow -\infty} y = -\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

3 real zeros



falls left
rises right

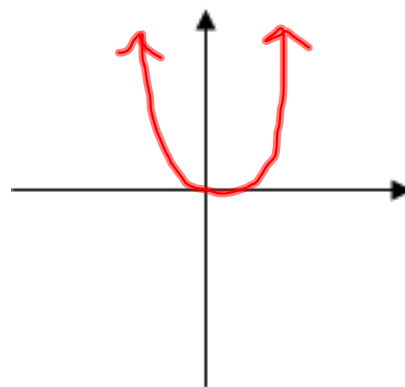
EX #6: $y = x^4$

even
y-axis

$$\lim_{x \rightarrow -\infty} y = +\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

1 real zero



rises left & right

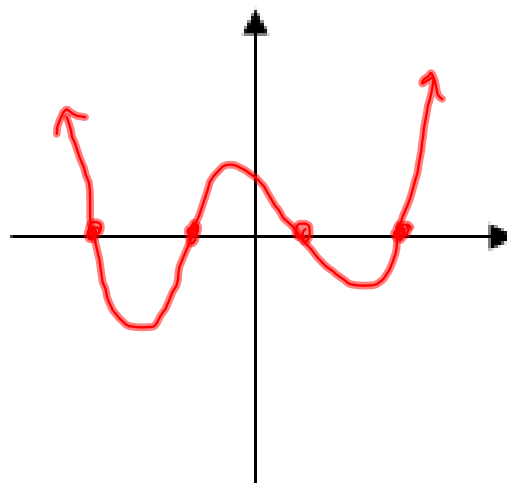
EX #7: $y = x^4 + \dots$

even
neither *

$$\lim_{x \rightarrow -\infty} y = +\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

4 real zero



rises left + right

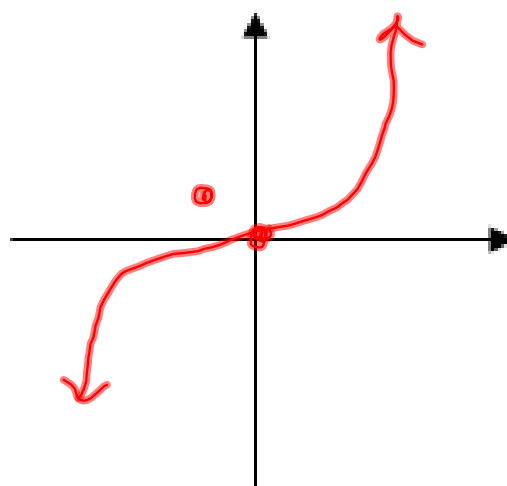
EX #8: $y = x^5$

odd
origin

$$\lim_{x \rightarrow -\infty} y = -\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

1 real zero



falls left
rises right

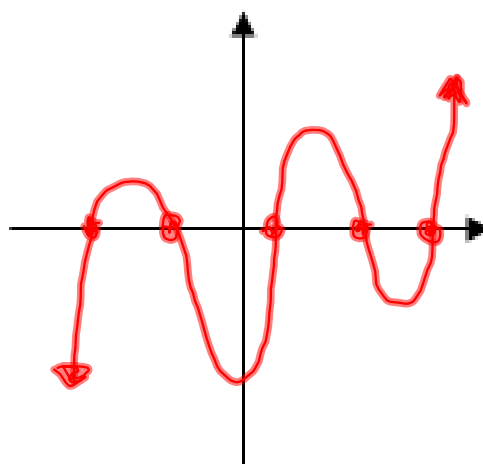
EX #9: $y = x^5 + \dots$

odd
neither*

$$\lim_{x \rightarrow -\infty} y = -\infty$$

$$\lim_{x \rightarrow +\infty} y = +\infty$$

5 real zero



falls left
rises right

Ex #10 Can you tell?

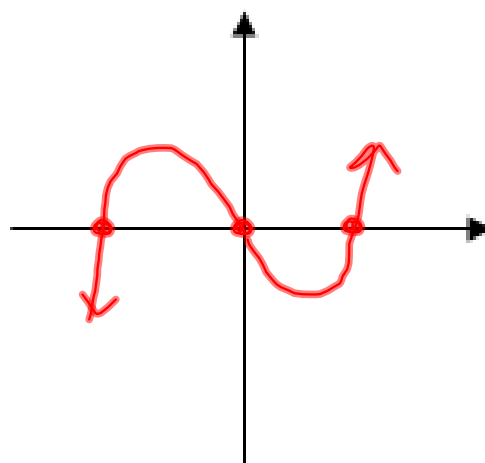
$$y = x^3 - x$$

odd

$$x(x^2 - 1) = 0$$

$$x = 0, 1, -1$$

origin



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