Algebra 2   5.3
Evaluate polynomial functions
Identify general shapes of polynomial function graphs

parent graph   .
degree   Quiz 5.1-5.2
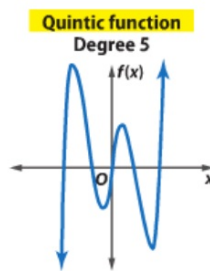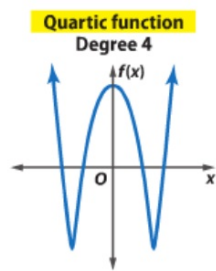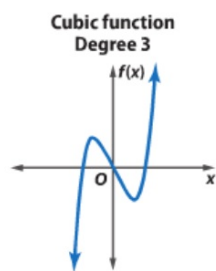coefficient
leading coefficient
function notation
end behavior
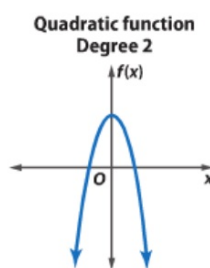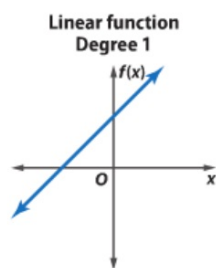even function
odd function

activity: graph matching

2 Graphs of Polynomial Functions

The general shapes of the graphs of several polynomial functions show the *maximum* number of times the graph of each function may intersect the x-axis. This is the same number as the degree of the polynomial.

Constant function
Degree 0

Linear function
Degree 1

Quadratic function
Degree 2

Cubic function
Degree 3

Quartic function
Degree 4

Quintic function
Degree 5
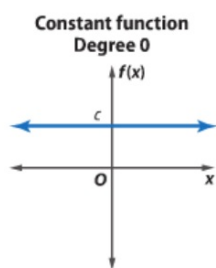
\# crossing points
\# max/min (turning points)
end behavior

KeyConcept End Behavior of a Polynomial Function

Degree: even
Leading Coefficient: positive
End Behavior:

∞

$f(x) \longrightarrow +\infty$
as $x \longrightarrow -\infty$

$-\infty$

$y = x^2$

$f(x) \longrightarrow +\infty$
as $x \longrightarrow +\infty$

$y \Rightarrow \infty$ if $x \Rightarrow \infty$
$y \Rightarrow \infty$ if $x \Rightarrow -\infty$

Domain: all real numbers
Range: all real numbers ≥ minimum

Degree: odd
Leading Coefficient: positive
End Behavior:

$f(x) \longrightarrow -\infty$
as $x \longrightarrow -\infty$

$y = x^3$

$f(x) \longrightarrow +\infty$
as $x \longrightarrow +\infty$

Domain: all real numbers
Range: all real numbers

$y \Rightarrow \infty$ if $x \Rightarrow \infty$
$y \Rightarrow -\infty$ if $x \Rightarrow -\infty$

Degree: even
Leading Coefficient: negative
End Behavior:

$f(x) \longrightarrow -\infty$
as $x \longrightarrow -\infty$

$f(x) \longrightarrow -\infty$
as $x \longrightarrow +\infty$

$y = -x^4$

$-\infty$ $-\infty$

Domain: all real numbers
Range: all real numbers ≤ maximum

Degree: odd
Leading Coefficient: negative
End Behavior:

$f(x) \longrightarrow +\infty$
as $x \longrightarrow -\infty$

$f(x) \longrightarrow -\infty$
as $x \longrightarrow +\infty$

$y = -x^5$

Domain: all real numbers
Range: all real numbers

$y \Rightarrow \infty$ if $x \Rightarrow -\infty$
$y \Rightarrow -\infty$ if $x \Rightarrow \infty$

$y \Rightarrow -\infty$ if $x \Rightarrow \infty$
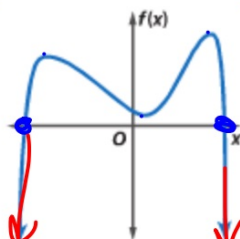$y \Rightarrow -\infty$ if $x \Rightarrow -\infty$

You have to know the code:
y does this….. when x does this….

Example 4 Graphs of Polynomial Functions

For each graph,
- describe the end behavior,
- determine whether it represents an odd-degree or an even-degree polynomial function, and
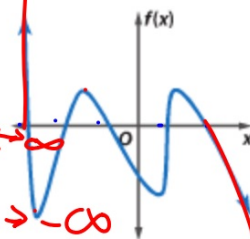- state the number of real zeros.

a.

b.

$y \to -\infty$ if $x \to \infty$

$y \to -\infty$ if $x \to -\infty$

$d = 4$ even
zeros = 2

say it first... then translate (code)
"y does this...
"when x does this...

$y \to \infty$ if $x \to -\infty$
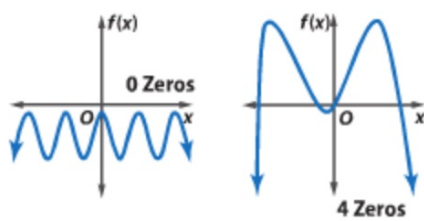
$y \to -\infty$ if $x \to \infty$

$d = 5$ (odd)
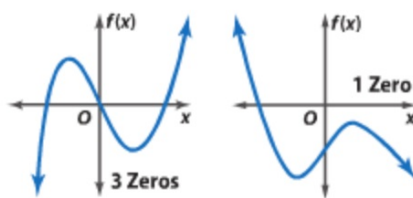
zeros = 5

matching activity

KeyConcept Zeros of Even- and Odd-Degree Functions

Odd-degree functions will always have an odd number of real zeros. Even-degree functions will always have an even number of real zeros or no real zeros at all.
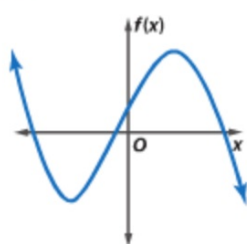
Even-Degree Polynomials

0 Zeros

4 Zeros

Odd-Degree Polynomials

3 Zeros

1 Zero

▶ **Guided**Practice

4A.

4B.