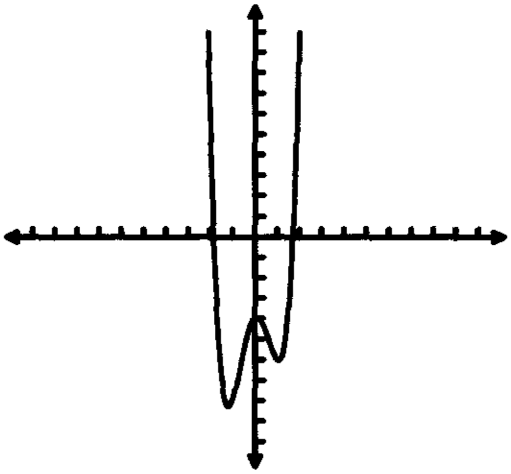
Name: ____________________ Date: _________

Getting Ready for Section 2.2: Polynomial Functions of Higher Degree

Polynomial Functions: A continuous function with a degree of one or more. It is named by its highest degree.

Continuous:

$f(x) = 2 \cdot x^4 - 5 \cdot x^2 + x - 4$



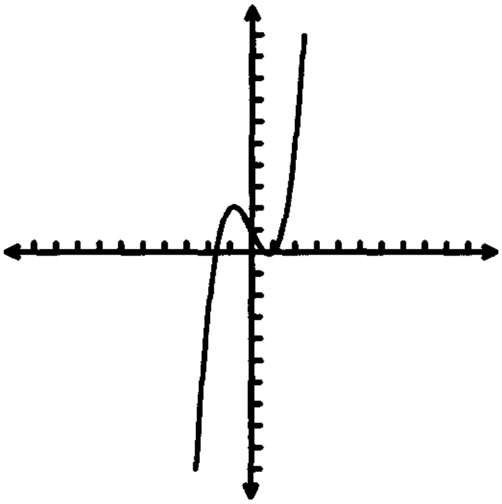
Highest Degree:

Leading Coefficient:

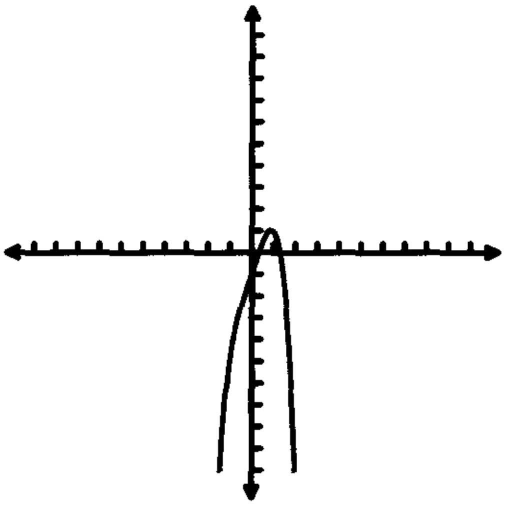
End Behavior:

Describe the **end behavior** of the following function using ~~regular and lim~~it ~~notatio~~n.

$f(x) = x^3 - 2 \cdot x + 1$



$f(x) = -(x^4) + 3 \cdot x - 1$



Name: ________________ Group 3

Discovering End Behavior of Polynomial Functions (2.2)

Graph the functions on your calculator and roughly sketch the graph of each at the appropriate station. Also, record the end behavior of each below.

a. $f(x) = x^6 - 2\cdot x^3 - x + 1$

b. $f(x) = 3\cdot x + 2$

c. $f(x) = -3\cdot x^4 - x + 3$

d. $f(x) = 6\cdot x^2 + 3\cdot x - 2$

e. $f(x) = 4\cdot x^5 + 3\cdot x - 4$

f. $f(x) = -(x^3) + 3\cdot x + 1$

<u>Station 1:</u> End Behavior:

What do you notice about the leading coefficients at this station?

What do you notice about the highest degree?

What generalization can you make about the polynomials at Station 1 and the end behavior of their graphs?

<u>Station 2:</u> End Behavior:

What do you notice about the leading coefficients at this station?

What do you notice about the highest degrees?

What generalization can you make about the polynomials at Station 2 and the end behavior of their graphs?

<u>Station 3:</u> End Behavior:

What do you notice about the leading coefficients at this station?

What do you notice about the highest degree?

What generalization can you make about the polynomials at Station 3 and the end behavior of their graphs?

<u>Station 4:</u> End Behavior:

What do you notice about the leading coefficients at this station?

What do you notice about the highest degree?

What generalization can you make about the polynomials at Station 4 and the end behavior of their graphs?

Name: ____________________________ Date: ________

Section 2.2 Notes: Graphs of Polynomial Functions of Higher Degree

End Behavior: "Leading Coefficient Test"

1. When highest degree is odd, and leading coefficient is positive

2. When highest degree is odd, and leading coefficient is negative

3. When highest degree is even, and leading coefficient is positive

4. When highest degree is even, and leading coefficient is negative

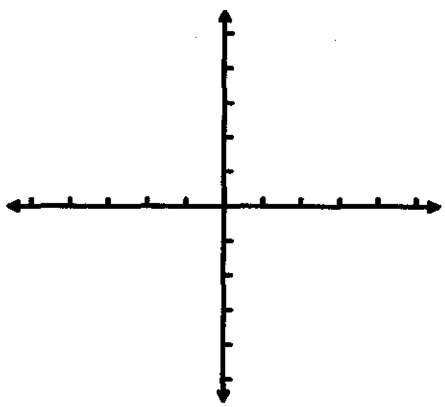
Practice: Apply the leading coefficient test to describe the right-hand and left-hand end behavior of the following graphs.

1) $f(x) = -(x^3) + 4 \cdot x - 3$

2) $f(x) = x^6 - 5 \cdot x^2 + 4$

Sketch the following polynomial by finding its zeros and end behavior.

1) $f(x) = x^3 - x^2 - 2 \cdot x$



Real Zeros of a Polynomial Function

A real number **a** is a **zero** of a function f(x) if and only if f(a) = 0.

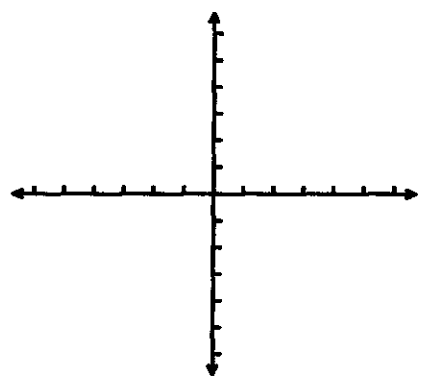
If f(x) is a polynomial function and a is a real number, then the following statements are equivalent: (if one of these is true, then all are true)

1. a is a zero of f
2. (a, 0) is an x-intercept of the graph of f(x)
3. a is a solution of the polynomial equation f(x) = 0
4. (x - a) is a factor of the polynomial f(x)

If the highest degree of the polynomial is n, then the function
1) has at most ___ real zeros
2) has at most ______ extrema (relative maxs or mins).

Repeated Zeros

Example: Find all the real zeros of
$f(x) = x^2 - 6x + 9$ and sketch the graph.

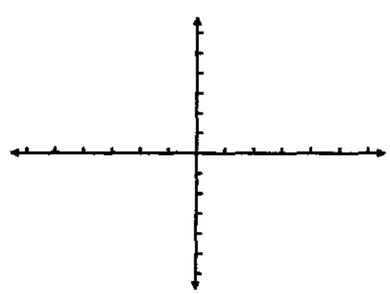


Definition: Repeated Zeros : If $(x - a)^k$ with $(k > 1)$ is a factor or f(x), then **a** is a **repeated zero** with multiplicity k.

1. If k is **odd**, then the graph of f(x) crosses the x-axis at (a, 0).

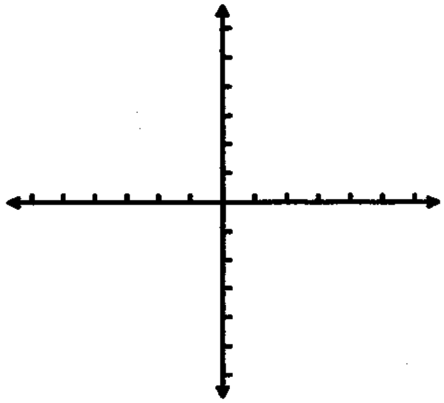
2. If k is **even**, then the graph of f(x) ______________________________

Example: Determine the zeros and multiplicity of the zeros of
$f(x) = (x - 3)^3 \cdot (x + 1)^4$ and sketch.

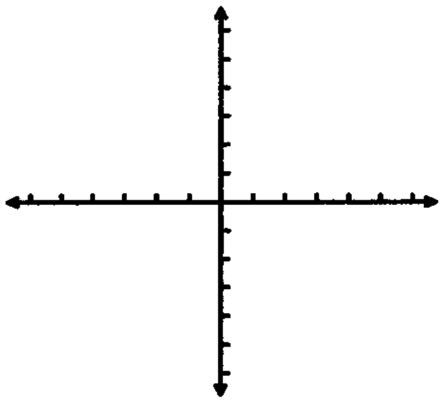


Practice: Find all the real zeros of the polynomial function and sketch the graph.

1. $f(x) = x^3 - 4 \cdot x^2 + 4 \cdot x$



2. $f(x) = 3 \cdot x^4 - 4 \cdot x^3$



Finding a Polynomial Function Given the Zeros:

If I am given that x = 2 is a zero of a function, how can we write the zero in factored form?

Example: Find a polynomial function with the following zeros...

1) 2, -5

2) 3, 3, -1/2

Use your calculator to find the zeros: $f(x) = 12 \cdot x^3 - 32 \cdot x^2 + 3 \cdot x + 5$