BELL ACTIVITY:

Solve: $2x^3 - 4x^2 - 6x = 0$ (check with GUT)

RECALL SPECIAL FUNCTIONS STUDIED SO FAR:

$f(x) = c$	$f(x) = mx + b$	$f(x) = ax^2 + bx + c$
constant	linear	quadratic

WHAT'S NEXT?!

$f(x) = x^3 - x^2 - 2x$

$f(x) = x(x - 2)(x - 1)$

$g(x) = 2x^4 + 7x^3 - 4x^2 - 27x - 18$

$g(x) = (x-2)(x+3)(2x+3)(x+1)$

(These represent the same function, written in a different form)

You did this in Algebra 2...we will review how to rewrite and graph these functions!

Let's start with the easy ones...

<u>SKETCH</u>:

$f(x) = -x^5$

$g(x) = x^4 + 1$

$h(x) = (x + 1)^4$

Even exponent:

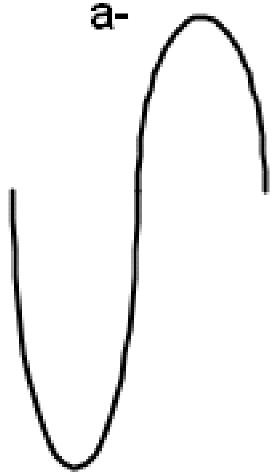
Odd exponent:

(See the "Leading Coeficient Test" on pg. 149)

odd exponent

a+

a-



<u>for a+</u>

as x--> ∞, f(x)--> ∞

as x--> -∞, f(x)--> -∞

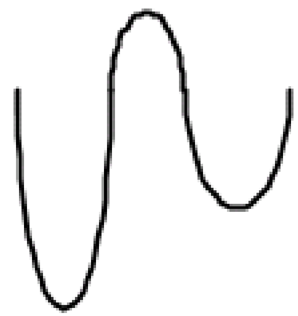
<u>for a-</u>

as x--> ∞, f(x) --> -∞

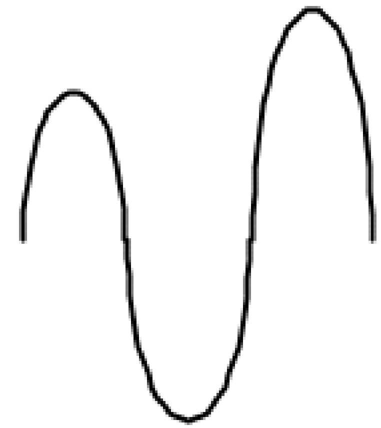
as x--> -∞, f(x)--> ∞

even exponent

a+



a-



<u>for a+</u>

as x--> ∞, f(x)--> ∞

as x--> -∞, f(x)--> ∞

<u>for a-</u>

as x--> ∞, f(x) --> -∞

as x--> -∞, f(x)--> -∞

SOME TERMINOLOGY:

x = a   is a "zero" of the function f(x)

x = a is a "solution" of the polynomial equation f(x) = 0

(x - a) is a "factor" of the polynomial function f(x)

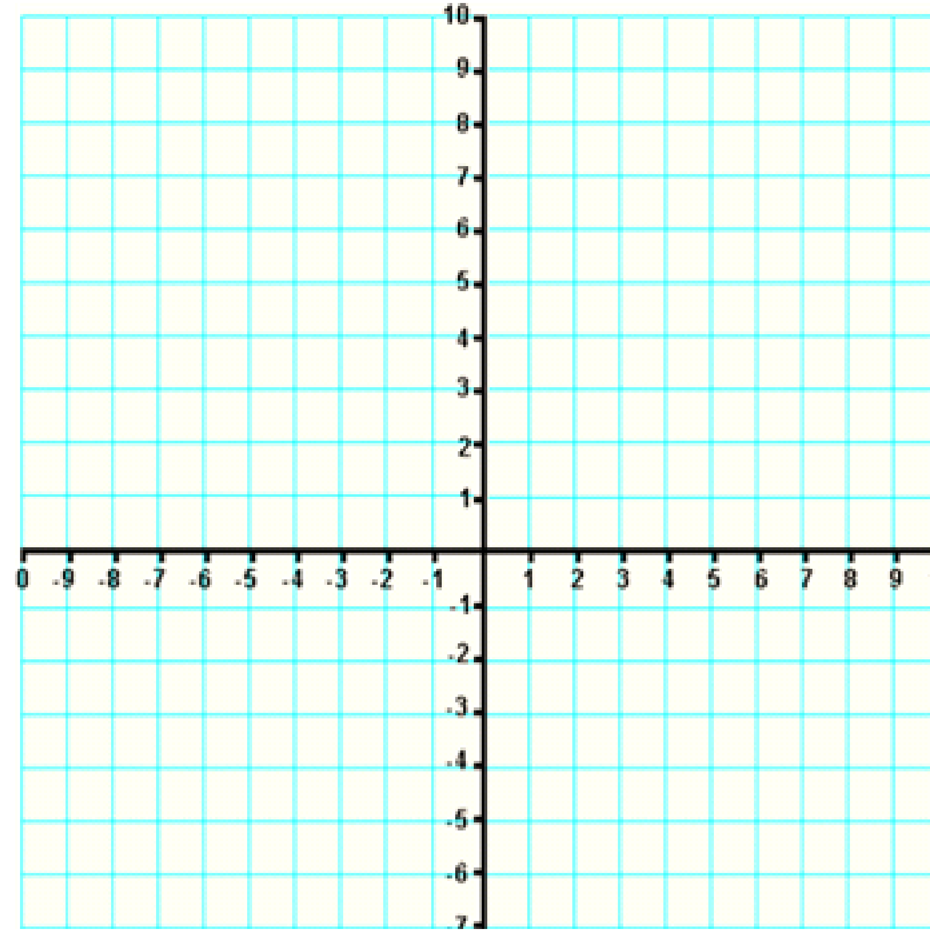
(a,0) is an "x-intercept" of the graph of f(x)

RECALL:

*A function of degree 'n' has a most 'n' real zeros.

*If the degree of a function is n, then the number of total zeros (real or nonreal) is n. (FTA)

EX: Find all real zeros of $f(x) = x^3 - x^2 - 2x$



EX: Find all real zeros of $f(x) = -2x^4 + 2x^2$

What's so special about this function?

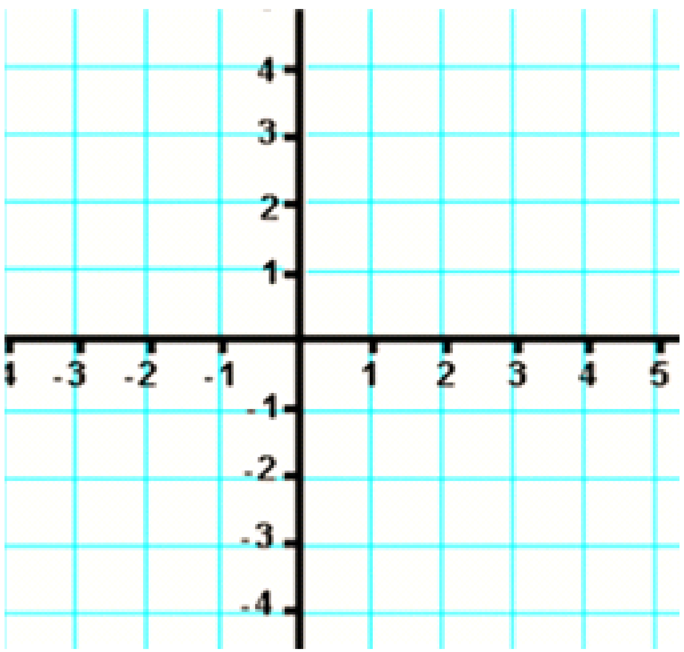
"Multiplicity of 2" means a double root....2 zeros that are the same.
(graph touches the x-axis, but doesn't go through)

An even multiplicity will always do this. An odd multiplicity (3 or 5 or...) means a function has 3 or 5 or ... zeros that are the same.

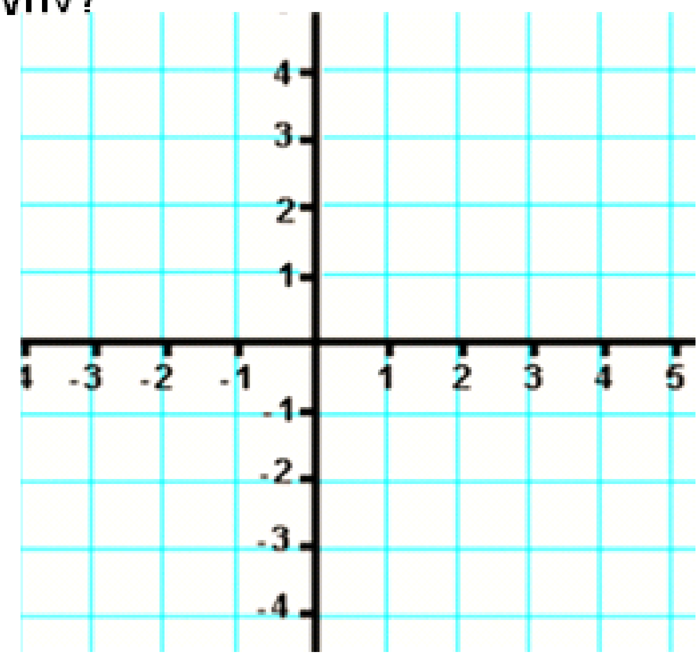
An odd multiplicity will go on through the axis...boring

Examples:

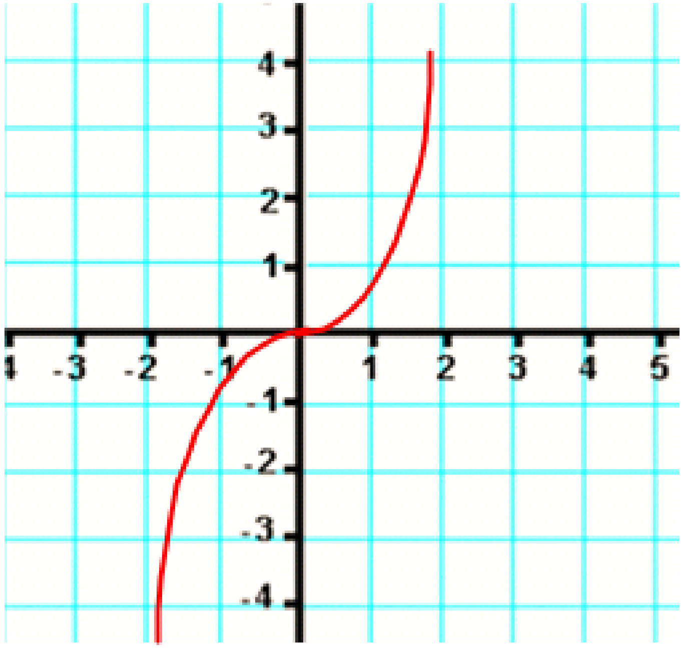
y = 3(x-1)(x-1)(x+2) has zeros 1,1,-2; so there is a multiplicity of 2 at x = 1



y = -3(x-1)(x-1)(x+2) has zeros 1,1,-2 as well, but the graph is different. Why?



$y = x^3$ has a multiplicity of ____ at x = ____



EX6: Find a polynomial function whose zeros are -2, -1, 1, 2

If -2 is a zero then we know that ______ is a factor.

$f(x) = (x+2)(x+1)(x-1)(x-2)$

multiply....

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

NOTE: if -½ is a zero, what is a factor? not $x + \frac{1}{2}$ ..... $2x + 1$!

Find a function whose zeros are 2, $\sqrt{11}$ and $-\sqrt{11}$.

Sketch $f(x) = 3x^4 - 4x^3$.....by hand

(Use all you know...LCT, zeros, intercepts, extra points..)

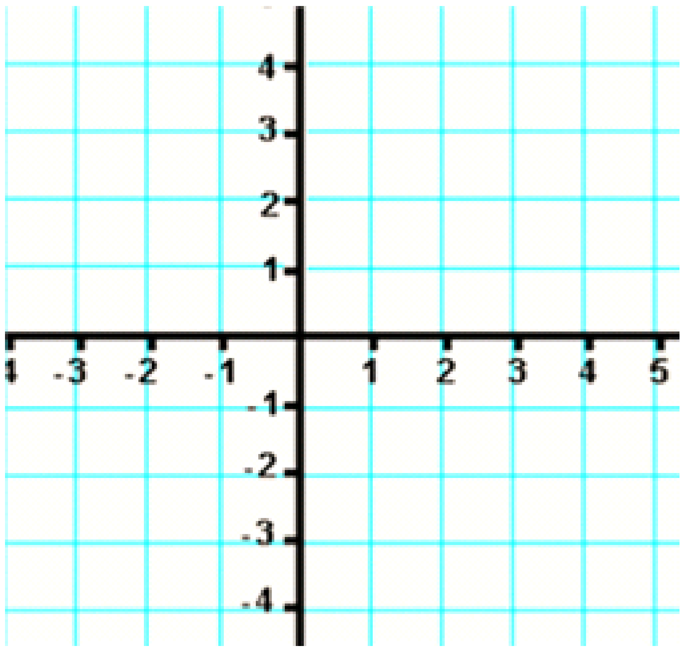
degree is 4 (even) and LC is +, so end behavior is.....both up!

factor: $f(x) = x^3(3x-4)$

$x = 0$ (triple root!) and $x = 4/3$

Now, find some other points to help you sketch this sucker!

(1,______)
(2,______)
(-1,_____)
(1.5,___)
(.5,_____)



EX8: sketch $f(x) = -2x^3 + 6x^2 - 9/2x$