Odd Functions: Largest exponent is ODD

This is called the degree of the function.

Positive Leading Coefficient:

Moves from the third quadrant to the first quadrant.

Like a line with a Positive slope

Negative Leading Coefficient:

Moves from the second quadrant to the fourth quadrant.

Like a line with a Negative slope

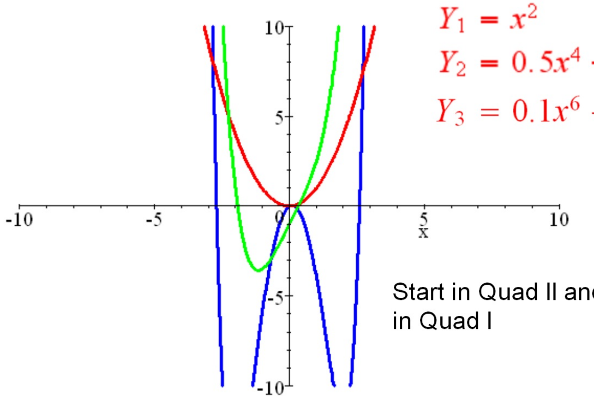
Graph all three of these in a Standard Window:

$$Y_1 = x^2$$

$$Y_2 = 0.5x^4 + 3x - 1$$

$$Y_3 = 0.1x^6 - 5x^2 + x$$

What do the graphs have in common?



$$Y_1 = x^2$$

$$Y_2 = 0.5x^4 + 3x - 1$$

$$Y_3 = 0.1x^6 - 5x^2 + x$$

Start in Quad II and end in Quad I

What do the equations have in common?

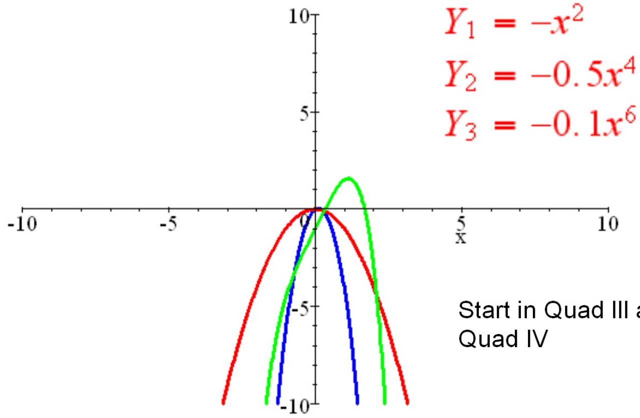
$$Y_1 = x^2$$

$$Y_2 = 0.5x^4 + 3x - 1$$

$$Y_3 = 0.1x^6 - 5x^2 + x$$

$$Y_1 = x^2$$
$$Y_2 = 0.5x^4 + 3x - 1$$
$$Y_3 = 0.1x^6 - 5x^2 + x$$

What would happen if they all had a negative leading coefficient?



$$Y_1 = -x^2$$
$$Y_2 = -0.5x^4 + 3x - 1$$
$$Y_3 = -0.1x^6 - 5x^2 + x$$

Start in Quad III and end in Quad IV

Even Functions: Largest exponent is EVEN

This is called the degree of the function.

Positive Leading Coefficient:

Moves from the second quadrant to the first quadrant.

Like a parabola with a>0

Negative Leading Coefficient:

Moves from the third quadrant to the fourth quadrant.

Like a parabola with a<0

End-Behavior:

The behavior of the graph on the far left and the far right.

How the value of the function (y) changes as x becomes larger negative LEFT END and larger positive RIGHT END.

END BEHAVIOR

EVEN Functions:

Positive Leading Coefficient:	Negative Leading Coefficient:
(↖ , ↗)	(↙ , ↘)
OR	OR
as $x \to -\infty, y \to \infty$	as $x \to -\infty, y \to -\infty$
as $x \to \infty, y \to \infty$	as $x \to \infty, y \to -\infty$
$x \to \pm\infty, y \to \infty$	$x \to \pm\infty, y \to -\infty$

END BEHAVIOR

ODD Functions:

Positive Leading Coefficient:	Negative Leading Coefficient:
(↙ , ↗)	(↖ , ↘)
OR	OR
as $x \to -\infty, y \to -\infty$	as $x \to -\infty, y \to \infty$
as $x \to \infty, y \to \infty$	as $x \to \infty, y \to -\infty$

Describe the end behavior of each polynomial.

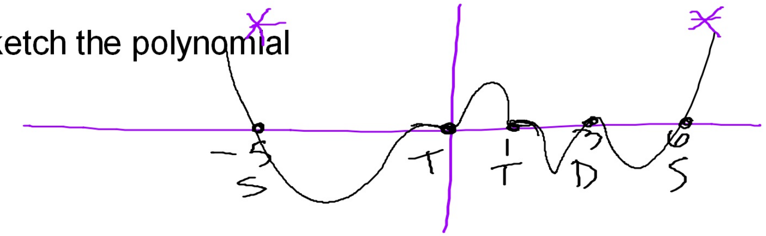
1. $y = -5x^3 + 7x^2 + 4x + 33$ ODD NEG
   (↖ , ↘) OR $x \to -\infty, y \to \infty$; $x \to +\infty, y \to -\infty$
2. $y = x(x+3)^2(x-5)(x+1)^3$
   POS ODD (↙ , ↗)
3. $y = 9x^4 - 3x^2 + 11x - 13$
   POS EVEN (↖ , ↗) OR $x \to \pm\infty, y \to \infty$
4. $y = (x - 1)^2(x + 4)(6 - x)^3(x + 8)^2$
   + + − + NEG EVEN (↙ ↘)

You can now finish Hwk #20

Graph this polynomial:

$y = x^3(x - 6)(x - 1)^3(x + 5)(3 - x)^2$

1. Determine if
   - Its degree is ODD or EVEN
   - Its leading coeff is POS or NEG
2. Sketch the polynomial



How the book describes repeated zeros:

$y = x^3(x - 6)(x - 1)^3(x + 5)(3 - x)^2$

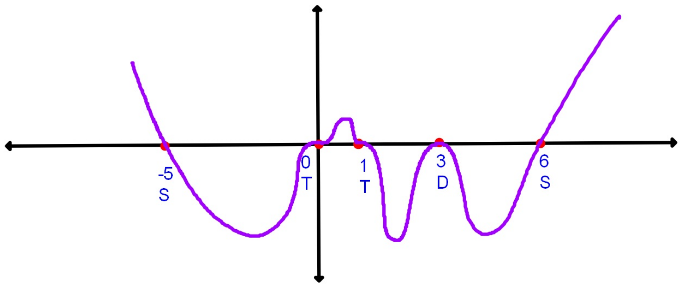
A repeated zero is called a Multiple Zero

The zero 1 has multiplicity 3

Graph this polynomial:

$y = x^3(x - 6)(x - 1)^3(x + 5)(3 - x)^2$

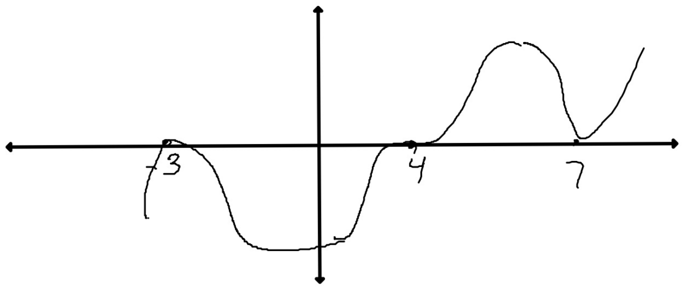
This is a Pos Even Function so it starts in Quad II and ends in Quad I



Graph each polynomial:

1. $y = (x - 7)^2(x - 4)^3(x + 3)^2$
2. $y = -x^3(x + 5)(x - 6)^3(x + 1)$
3. $y = x(x + 1)^3(3 - x)^3(x - 2)^2$

1. $y = (x - 7)^2(x - 4)^3(x + 3)^2$



Pos. ODD

↓ ↗