<u>Pre-Calc. 12</u> <u>3.1Polynomials</u>

In this section we will develop an understanding of the characteristics of a polynomial functions so we can sketch their graphs.

- A polynomial is an expression in the form

$$a_nx^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \ldots + a_2x^2 + a_1x + a_0 \ , \ a_n \neq 0$$

Polynomials in standard form are written in descending order of exponents

Do examples 1 and 2 on page 113

- Shape of Polynomial Graphs are continuous (no breaks or sharp corners)

Do examples 3 and 4 on page 114

- Polynomials of the form $f(x)=x^n$ and $-f(x)=x^n$ are simply reflections of each other about the x-axis.

Do example 5 on page 114 and make a note of the end behavior of each.

Equation of polynomial	**Degree of polynomial**	**Is it Positive or is it Negative?**	**Is it an Even or is it an Odd function?**	**End behavior**
$y = x$	1	positive	Odd	Low left High right
$y = -x$	1	negative	Odd	High left Low right
$y = x^2$	2	positive	Even	Opens UP Both ends point UP
$y = -x^2$	2	negative	Even	Opens Down Both ends point DOWN
$y = x^3$				
$y = -x^3$				
$y = x^4$				
$y = -x^4$				
$y = x^5$				
$y = -x^5$				

$y = x^6$				
$y = -x^6$				

What generalization can you make?

Now relate your generalization to the table on p.115 **Comparing $f(x) = \pm x^n$ slope of graphs**

- The **End Behavior of Polynomial** is simply determined by the leading coefficient of a polynomial written in Standard Form. You can see this by looking at page 116.

- The **Constant Value of a Polynomial Function** is the y-intercept.

For example, the y-intercept for $5x^3 + 3x^2 - x + 7$ is at (0,7)

Do Example 6 on p.117

- **Zeros of Polynomial Functions** are also known as **ROOTS**, **X-INTERCEPTS**, **and SOLUTIONS** Do Example 7 on p.117

A Polynomial Function of Degree *n* has at most, *n* solutions A Polynomial Function of Degree *n* has at most, *n* roots A Polynomial Function of Degree *n* has at most, *n* x-intercepts

Do Example 8 on p.118

- **Turning Points**
  If a polynomial has *n* turning points, it has a minimum degree of $n + 1$
  (p.118 explains this quite well)

- **Multiplicity**

When one solution is repeated *r* times, the function is said to have a solution of multiplicity *r* . Do example 9 on p.118