Definition 0.1. A polynomial function is of the form
\[ f(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 \]

Definition 0.2. The degree is the highest value exponent of the function \( f(x) \) above.

Here is a good chart to summarize the end behavior of polynomials that we covered in class. This includes all the necessary information to know along with some examples.

![End Behavior Chart](http://www.shelovesmath.com/algebra/advanced-algebra/graphing-polynomials/)

**Figure 1.** End Behavior Chart - From http://www.shelovesmath.com/algebra/advanced-algebra/graphing-polynomials/

Definition 0.3. The multiplicity of \( f(x) = x^n \) is the power of \( n \). If \( n \) is odd, then the graph crosses at the \( x \)-intercept. If \( n \) is even, then the graph touches at the \( x \)-intercept.

**Example 1.** Sketch the graph of \( f(x) = x(x+1)^2(x-1)^2 \).

**Example 2.** Sketch the graph of \( f(x) = x(x+1)(x-3)(x+5) \).

**Example 3.** Sketch the graph of \( f(x) = -x(x+2)(x-2) \).

**Example 4.** Sketch the graph of \( f(x) = -x(x+2)(x-3)^2 \).