**Colorado Technical University**

 **Course:** MATH116 – Foundations for Calculus

**Unit 4 Part 07 Readings: Polynomial Graphs**

**Graphing Polynomials**

A **monomial function** contains only a single variable

A **power function** is a monomial in which the variable is raised to a power: ƒ(x) = cxk

**NOTE:** while polynomials cannot legally have negative or fractional powers, a monomial CAN

**Even functions** have only positive, even integer exponents

These include constants (which are really the coefficient × x0) but NOT single “xs” (which would be x1, and 1 is not an even number)

**NOTE:** even functions don’t have to be monomial!

 A polynomial is even if each *term* is an even function

**Odd functions** have only positive, odd integer exponents

This includes the single “xs” (x1) but not the constants

**Zeros**

If ƒ(value) = 0 then value is called a “zero” of the function

This is the same as finding all the values of the function for which y=0

If the values are real numbers, they are called “**real zeros**”

If the values are complex numbers, they are called “**complex zeros**”

The real zeros are the x-values of the points where the curve crosses the x-axis

(where y=0)

**The graph of a polynomial function** ƒ(x) = anxn +an-1xn-1 + … + a1x + a0 an ≠ 0

Degree of a polynomial function ƒ: n

 y-intercept: ƒ(0) = a0

 Graph is smooth and continuous

 Maximum number of turning points: n-1

 If (x-r)m is a factor of a polynomial ƒ and (x-r)m+1 is not a factor of ƒ, then r is called a

zero of multiplicity m of ƒ

 At a zero of even multiplicity, the graph of ƒ touches the x-axis

 At a zero of odd multiplicity, the graph of ƒ crosses the x-axis

 Between zeros, the graph of ƒ is either above or below the axis

 End behavior: for large |x|, the graph of ƒ behaves like the graph of y = anxn

**Analyzing the graph of a Polynomial Function**:

 Step 1: Determine the end behavior of the function

 Step 2: Find the x- and y-intercepts of the graph

 Step 3: Determine the zeros of the function and their multiplicity

 Use this information to determine whether the graph touches or crosses the x-

 axis at each x-intercept

 Step 4: Determine the maximum number of turning points on the graph of the function

 Step 5: Use the information in Steps 1-4 to draw a complete graph of the function.

 To help establish the y-axis scale, find additional points on the graph on each

side of any x-intercept

For polynomial functions that have noninteger coefficients and for polynomials that are not easily factored, use a graphing utility. This is because the amount of information that can be obtained from algebraic analysis is limited.



