Section 5.2

Graphing Polynomial Functions; Models

GRAPH OF A POLYNOMIAL FUNCTION

Let $f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0,\ a_n \neq 0$ be a polynomial function.

- Degree of f: n
- y-intercept: $(0, a_0)$
- The graph is smooth and continuous.
- Maximum number of turning points: $n - 1$
- At a zero of even multiplicity: The graph touches the x-axis.
- At a zero of odd multiplicity: The graph crosses the x-axis.
- Between the zeros, the graph of f is either above or below the x-axis.
- End behavior: For large $|x|$, the graph of f behaves like the graph of $y = a_n x^n$.

ANALYZING THE GRAPH OF A POLYNOMIAL FUNCTION

Step 1: Determine the end behavior of the graph of the function.

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

Step 3: Determine the zeros of the function and their multiplicity. Use this information to determine whether the graph crosses or touches the x-axis at each x-intercept.

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

Step 5: Use the information in Steps 1 through 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-intercepts.