## Chapter 3 Summary

## A. Characteristics of Polynomials

$$
f(x)=a_{n} x^{n}+a_{n-1} x^{n-1}+a_{n-2} x^{n-2}+\ldots+a_{1} x^{1}+a_{0}
$$



- Even-numbered degrees have the same end behavior
- Odd-numbered degrees have the same end behavior


## B. Long Division with Polynomials

Division Statement: When $P(x)$ is divided by $x-a$

$$
\frac{P(x)}{x-a}=Q(x)+\frac{R}{x-a} \quad \text { or } \quad P(x)=Q(x)(x-a)+R
$$

a) Long Division
b) Synthetic Division

## C. The Remainder Theorem

The Remainder Theorem states that when a polynomial $P(x)$ is divided by $(x-a)$, the remainder is $P(a) . \quad R=P(a)$

## D. The Factor Theorem

The Factor Theorem states that $x-a$ is a factor of a polynomial $P(x)$, if and only if, $P(a)=0$.
Integral Zero Theorem
If $x-a$ is a factor of $P(x)$ with integral coefficients, then " $a$ " is a factor of the constant term of $P(x)$.

## E. Graphs of Polynomials

The multiplicity of a zero/root represents how many times a particular number is a zero for a given polynomial.

- Zeroes of odd multiplicity change sign at the zero.
- Zeroes of even multiplicity do not change sign at the zero.

Positive and negative intervals represent the $x$ - values for which the polynomial is either above or below the $x$-axis.

