Theorem 0.1 **[Remainder Theorem]** *If a polynomial $f(x)$ is divided by $x - c$, then the remainder is $f(c)$; that is, $f(x) = [x - c]q(x) + f(c)$ for some polynomial $q(x)$.*

Theorem 0.2 **[Factor Theorem]** *Let $f(x)$ be a polynomial with real coefficients. Then, $f(c) = 0$ if and only if $(x - c)$ is a factor of $f(x)$.*

Theorem 0.3 **[Rational Zero Theorem]** *Consider a polynomial $f(x)$ with integer coefficients. Then, if $f(x)$ has rational (fraction) zeroes, they must be of the form $\pm\frac{p}{q}$ where p divides the constant term and q divides the leading coefficient of f.*

Theorem 0.4 **[Conjugate Zeroes Theorem]** *Consider a polynomial $f(x)$ with integer coefficients. If $a + bi$ is a zero for $f(x)$, then $a - bi$ must be too. Also, if $a + b\sqrt{c}$ is a zero for $f(x)$, then $a - b\sqrt{c}$ must be too.*

Theorem 0.5 **[Fundamental Theorem of Algebra]** *Consider a degree n polynomial $f(x)$ with complex coefficients. Then, $f(x)$ has n complex zeroes (not necessarily distinct; we count multiplicity), and $f(x)$ may be written as a product of n linear factors with complex coefficients.*

3.3, #13: Use long division to find $(-20x^2 + 6x^4 - 16) \div (2x + 4)$

3.3, #17: Use long division to find $\frac{6x^4+3x^3-7x^2+6x-5}{2x^2+x-3}$

3.3, #41: Given $f(x) = 2x^4 - 5x^3 + x^2 - 7$, evaluate $f(4)$ and determine the remainder when $f(x)$ is divided by $(x - 4)$.

3.3, #55: Use the Factor Theorem to determine whether $(x + 5)$ and $(x - 2)$ are factors of $f(x) = x^4 + 11x^3 + 41x^2 + 61x + 30$.

3.3, #77: Find a polynomial of minimal degree with integer coefficients that has roots -2 (multiplicity 2) and $-3i$.

3.3, #91: Find m so that $x+2$ is a factor of $4x^3+5x^2+mx+2$.

3.4, #33: Given $2-5i$ is a zero for the polynomial $f(x)=x^4-4x^3+22x^2+28x-203$, find all zeros of f and write $f(x)$ as a product of linear factors.

3.4, #37: Given $-3+2i$ and $-\frac{1}{4}$ are zeros for the polynomial $f(x)=4x^5+37x^4+117x^3+87x^2-193x-52$, find all zeros of f and write $f(x)$ as a product of linear factors.

3.4, #95: Explain why a degree 3 polynomial with real coefficients MUST have at least one real zero.

3.4, Example (Like # 93): Determine whether the Intermediate Value Theorem guarantees that $f(x)=4x^3-5x^2-23x+6$ has a zero on the interval $[0,1]$. If there is a zero, find it using the Rational Zeroes Theorem and the Factor Theorem. Then, find the remaining zeroes of $f(x)$ and factor $f(x)$ into a product of linear factors.