Notes Factor and Remainder Theorems

The Remainder Theorem:

Suppose a polynomial $f(x)$ is divided by $x-c$ and yields $f(x)=(x-c)\cdot q(x)+r$

Then the remainder, r, is equal to the value $f(c)=r$.

Find the remainder:

EX1: $f(x)=2x^3+7x^2-x+12 \quad ; \quad x+4$	EX2: $f(x)=6x^4-7x^3-11x^2+2x+3 \quad ; \quad x+1$

Use the Remainder Theorem to evaluate $f(c)$

Ex3: $f(x)=-x^3+11x^2+7x-19 \quad and \quad c=5$	EX4: $f(x)=x^3+4x^2-7x \quad and \quad c=5$

Zero of a Polynomial:

A complex number, c, is said to be a zero of polynomial f, if $f(c)=0$ (if when we synthetically divide we get a remainder of zero).

Determine if the number c, is a zero of polynomial f

EX5: $f(x)=3x^3+2x^2-x+6 \quad and \quad c=-2$	EX6: $f(x)=x^3+2x^2-4x-8 \quad and \quad c=-2$

Factor Theorem:

Let $f(x)$ be a polynomial and c be a complex number. Then $x-c$ is a factor of $f(x)$ if and only if $f(c)=0$.

Determine if c is a factor of $f(x)$. If c is a factor, then factor $f(x)$ completely.

EX7: $f(x)=x^3+2x^2-4x-8 \quad and \quad c=-2$	EX8: $f(x)=-x^4+2x^2+x+3 \quad and \quad x-1$

Factor $f(x)$ completely given that c is a zero of f of multiplicity k

EX8: $f(x)=4x^4-9x^3+3x^2+5x-3 \quad and \quad c=1 \quad of \quad multiplicity \quad of \quad 3$
Ex9: $f(x)=3x^4+5x^3-3x^2-9x-4 \quad and \quad c=-1 \quad of \quad multiplicity \quad of \quad 3$