2.5 Apply the Remainder and Factor Theorems

Monday, December 4, 2017 7:12 AM

Polynomial Long Division

Divide $f(x) = 3x^4 - 5x^3 + 4x - 6 \ by \ x^2 - 3x + 5$

$$\begin{array}{r|l} & 3x^2 + 4x - 3 \\ \hline x^2 - 3x + 5 & 3x^4 - 5x^3 + 0x^2 + 4x - 6 \\ & -\ (3x^4 - 9x^3 + 15x^2) \\ & 4x^3 - 15x^2 + 4x \\ & -\ (4x^3 - 12x^2 - 20x) \\ & -3x^2 - 16x - 6 \\ & -\ (-3x^2 + 9x - 15) \\ & -25x + 9 \end{array}$$

$$3x^2 + 4x - 3 + \frac{-25x + 9}{x^2 - 3x + 5}$$

Synthetic Division

Synthetic division can be used to divide any polynomial by a divisor of the form x-k

$Divide \ f(x) = x^3 + 5x^2 - 7x + 2 \qquad by \ \ x - 2$

$$\begin{array}{c|cccc} 2 & 1 & 5 & -7 & 2 \\ & & 2 & 14 & 14 \\ \hline & 1 & 7 & 7 & 16 \end{array}$$

1 7 7 ← Coefficients

16 ← Remainder

$$x^2 + 7x + 7 + \frac{16}{x - 2}$$

Factor a Polynomial

Factor $f(x) = 3x^3 - 4x^2 - 28x - 16$ $\quad completely\ given\ that\ (x+2)\ is\ a\ factor$

-2	3	-4	-28	-16
		-6	20	16
	3	-10	-8	0 ← *Remainder Must be Zero*

$(x+2)(3x^2 - 10x - 8)$	AC Method
$(3x^2 - 12x)(2x - 8)$	GCF each group
$3x(x-4) + 2(x-4)$	GCF again
$(x+2)(x-4)(3x+2)$	