Date:_________________

Algebra II　　　　　　　　　　　　　　　　　　　　　　Notes 6.3 Day 2

Synthetic Division

Objective: To divide polynomials using synthetic division.

Vocabulary and Key Concepts

Synthetic Division: A method of dividing polynomials in which all variables and exponents are omitted and division is performed on the list of coefficients.

Use synthetic division to divide $5x^3 - 6x^2 + 4x - 1$ by $x - 3$

Step 1 Reverse the sign of the constant term in the divisor. Write the coefficients of the polynomial in standard form.

$$x - 3\overline{)5x^3 - 6x^2 + 4x - 1}$$

$$3 \quad 5 \quad -6 \quad 4 \quad -1$$

Step 2 Bring down the coefficient

$$\begin{array}{r|rrrr} 3 & 5 & -6 & 4 & -1 \\ & & \boxed{} & \boxed{} & \boxed{} \\ \hline & \boxed{5} & \boxed{} & \boxed{} & \boxed{} \end{array}$$

Step 3 Multiply the first coefficient by the new divisor. Write the result under the next coefficient. Add.

$$\begin{array}{r|rrrr} 3 & 5 & -6 & 4 & -1 \\ x & & \boxed{15} & \boxed{} & \boxed{} \\ \hline & 5 & 9 & \boxed{} & \boxed{} \end{array}$$

Step 4 Repeat the steps of multiplying and adding until the remainder is found.

$$\begin{array}{r|rrrr} 3 & 5 & -6 & 4 & -1 \\ x & & \boxed{15} & \boxed{27} & \boxed{93} \\ \hline & 5 & 9 & \boxed{31} & \boxed{92} \end{array}$$

The quotient (answer) is $5x^2 + 9x + 31$ R 92

Class Examples:

Use synthetic division to divide.

EX 1: $x^3 + 4x^2 + x - 6$ by $x + 1$

Determine whether x + 2 is a factor of each polynomial.

EX 2: $x^2 + 10x + 16$

EX 3: $x^3 + 7x^2 - 5x - 6$

Use synthetic division and the given factor to completely factor the polynomial function.

EX 4: $y = x^3 + 6x^2 - x - 30$; x + 3

The Remainder Theorem

If a polynomial P(x) of degree $n \geq 1$ is divided by $(x - a)$, where a is a constant, then the remainder is P(a).

Use synthetic division and the Remainder Theorem to find P(a).

EX 5: $P(x) = 2x^4 - 3x^2 + 4x - 1$; $a = 4$

EX 6: $P(x) = x^4 + x^3 - x^2 - 2x$; $a = 3$