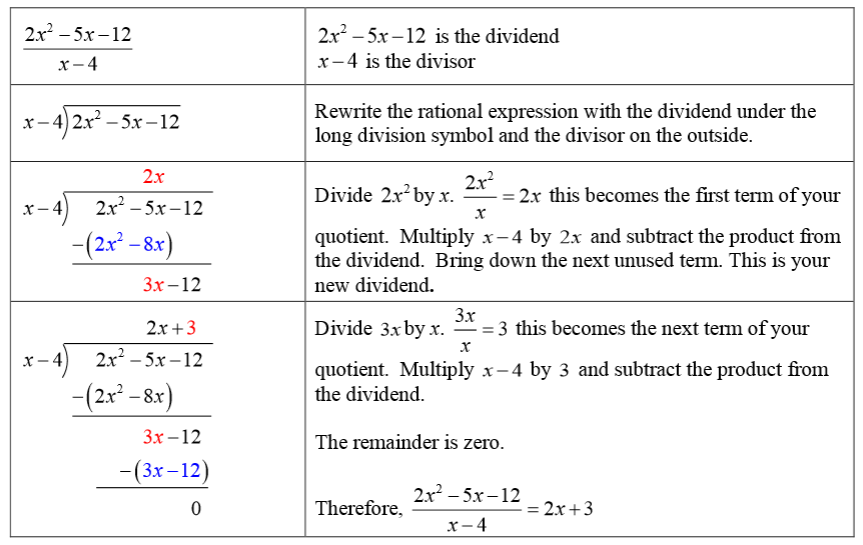
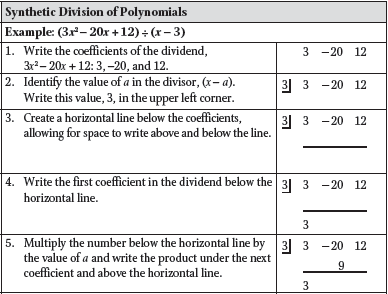
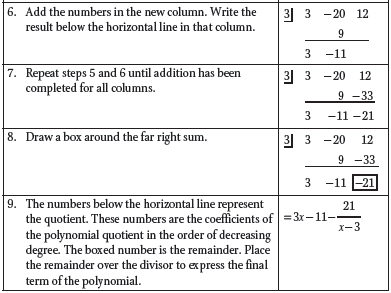
**2.5 Polynomial Division and the Remainder Theorem**

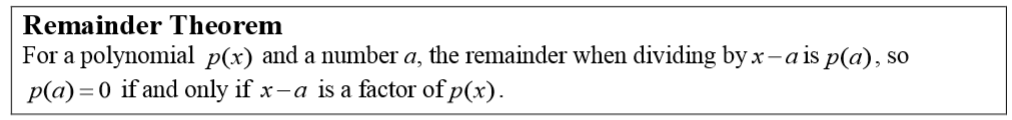
**Polynomial Long Division** can be used to divide by linear and nonlinear polynomials. It is similar to long division with real numbers.

Examples:

1. Use polynomial long division to divide

**Synthetic division** can be used to divide a polynomial by a linear polynomial

* To use synthetic division, the divisor must be of the form *(x-a)*, where *a* is a real number.
* Use the following steps to divide polynomials using synthetic division. An example has been provided for clarity.
* If the remainder is 0, then the divisor is a factor of the polynomial. This is called the remainder theorem



Examples:

1. Find the quotient of 2. Find the quotient of
2. Is a factor of? 4. Is a factor of?

Synthetic division can also be used to find the value of a function. This is known as **synthetic substitution**.

* To evaluate a polynomial using synthetic substitution, follow the same process described for synthetic division. For example, given the function , if you want to determine the value of the function at , use 3 as the *a* value in the divisor of the synthetic division. The resulting remainder gives the value of the polynomial when evaluated at .

Examples:

1. Evaluate at . 2. Evaluate for .

1. The amount of a certain medication remaining in the bloodstream *t* hours after taking the medicine is modeled by the equation . Package directions recommend taking a second dose 4-6 hours after the initial dose. Use synthetic substitution to show that these directions are accurate.