12.6 Special Products of Polynomials

**Learning Objectives:**
1. Multiply two binomials using the FOIL Method.
2. Square a binomial.
3. Multiply the sum and difference of two terms.
4. Use special products to multiply binomials.

**Special Products of Polynomials:**
1. **Product of Two Binomials:**  
   
   \[(a + b)(c + d) = ac + ad + bd + bc\]

2. **The Square of a Binomial Sum:**  
   
   \[(a + b)^2 = (a + b)(a + b) = a^2 + 2ab + b^2\]

3. **The Square of a Binomial Difference:**  
   
   \[(a - b)^2 = (a - b)(a - b) = a^2 - 2ab + b^2\]

4. **The Product of the Sum and Difference of Two Terms:**  
   
   \[(a + b)(a - b) = a^2 - b^2\]

**Example 1.** Simplify.

1. \((2y + 9)(3y - 5)\)
2. \((2y - 3)^2\)
3. \((y + 2)^3\)
4. \((2x + \frac{1}{3}y)(2x - \frac{1}{3}y)\)
5. \(2y(3y + 2)(y + 3)\)

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Read: Sections 13.1/13.2