

## Lesson 8-5

### Example 1 Add Polynomials

Find  $(9 - 5a^2 + a) + (a^2 + 3a^3 - 4a)$ .

**Method 1** Horizontal

Group like terms together.

$$\begin{aligned}(9 - 5a^2 + a) + (a^2 + 3a^3 - 4a) \\ = 3a^3 + (-5a^2 + a^2) + [a + (-4a)] + 9 & \text{ Associative and Commutative Properties} \\ = 3a^3 - 4a^2 - 3a + 9 & \text{ Add like terms.}\end{aligned}$$

**Method 2** Vertical

Align the like terms in columns and add.

$$\begin{array}{r} -5a^2 + a + 9 \\ (+) 3a^3 + a^2 - 4a \\ \hline 3a^3 - 4a^2 - 3a + 9 \end{array} \quad \begin{array}{l} \text{Notice that terms are in descending order} \\ \text{with like terms aligned.} \end{array}$$

### Example 2 Subtract Polynomials

Find  $(6x^2 - 17x^3 - 7) - (2x^2 - x^3 + x)$ .

**Method 1** Horizontal

Subtract  $2x^2 - x^3 + x$  by adding its additive inverse.

$$\begin{aligned}(6x^2 - 17x^3 - 7) - (2x^2 - x^3 + x) \\ = (6x^2 - 17x^3 - 7) + (-2x^2 + x^3 - x) & \text{ The additive inverse of } 2x^2 - x^3 + x \text{ is } -2x^2 + x^3 - x. \\ = (-17x^3 + x^3) + [6x^2 + (-2x^2)] - x - 7 & \text{ Group like terms.} \\ = -16x^3 + 4x^2 - x - 7 & \text{ Add like terms.}\end{aligned}$$

**Method 2** Vertical

Align like terms in columns and subtract by adding the additive inverse.

$$\begin{array}{r} 6x^2 - 17x^3 - 7 \\ (-) 2x^2 - x^3 + x \\ \hline \end{array} \quad \begin{array}{c} \text{Add the opposite.} \\ \rightarrow \end{array} \quad \begin{array}{r} 6x^2 - 17x^3 - 7 \\ (+) -2x^2 + x^3 - x \\ \hline 4x^2 - 16x^3 - x - 7 \end{array}$$

Thus,  $(6x^2 - 17x^3 - 7) - (2x^2 - x^3 + x) = 4x^2 - 16x^3 - x - 7$  or, arranged in descending order,  $-16x^3 + 4x^2 - x - 7$ .

### Example 3 Subtract Polynomials

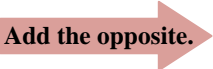
The total number of students  $S$  enrolled in schools consists of two groups, public  $U$  and private  $R$ . From 1989 through 1999, the number (in thousands) of public school students and private school students could be modeled by the following equations, where  $n$  is the number of years since 1989.

$$S = 716.4n + 45,711$$

$$R = 82n + 5198$$

- a. Find an equation that models the number of students in public schools  $U$  for this time period.

You can find a model for  $U$  by subtracting the polynomial for  $R$  from the polynomial for  $S$ .

Total	$716.4n + 45,711$		$716.4n + 45,711$
- Private	$(-) \underline{82n + 5198}$		$(+) \underline{-82n - 5198}$
Public			$634.4n + 40,513$

An equation is  $U = 634.4n + 40,513$ .

- b. Use the equation to predict the number of public school students in the year 2005.

The year 2005 is  $2005 - 1989$  or 16 years after the year 1989. If this trend continues, the number of public school students in 2005 would be  $634.4(16) + 40,513$  thousand or about 50,663,400.