

Section 5.1

Adding and Subtracting Polynomials

That's Not Fair!

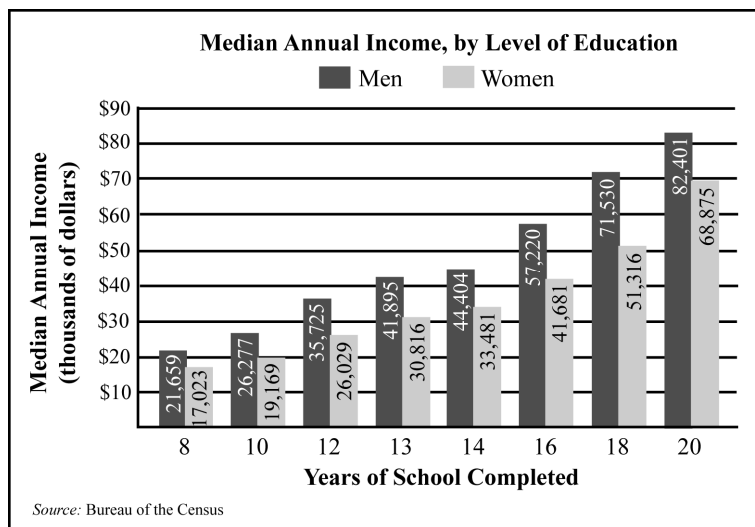
Good News:

As you complete more years of education, you can count on a greater income.

Bad News:

At the same level of education, women generally have a lower income than men.

The bar graph below shows the median annual income for Americans, by level of education, for a recent year. It shows the data for both men and for women.



In this section of the textbook, we will work with algebraic expressions that model this data.

First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 5.1 of your textbook which begins on page 340.
- Complete the *Concept and Vocabulary Check* on page 346 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Understand the vocabulary used to describe polynomials.

 **Solved Problem #1**

1. Identify the polynomial as a monomial, a binomial, or a trinomial. Give the degree of the polynomial.

$$7x^5 - 3x^3 + 8$$

$7x^5 - 3x^3 + 8$ is a trinomial of degree 5.

 **Pencil Problem #1** 

1. Identify the polynomial as a monomial, a binomial, or a trinomial. Give the degree of the polynomial.

$$x^2 - 3x + 4$$

Objective #2: Add polynomials.

 **Solved Problem #2**

- 2a. Add the polynomials:

$$(-11x^3 + 7x^2 - 11x - 5) + (16x^3 - 3x^2 + 3x - 15)$$

$$\begin{aligned} &(-11x^3 + 7x^2 - 11x - 5) + (16x^3 - 3x^2 + 3x - 15) \\ &= -11x^3 + 7x^2 - 11x - 5 + 16x^3 - 3x^2 + 3x - 15 \\ &= -11x^3 + 16x^3 + 7x^2 - 3x^2 - 11x + 3x - 5 - 15 \\ &= 5x^3 + 4x^2 - 8x - 20 \end{aligned}$$

 **Pencil Problem #2** 

- 2a. Add the polynomials:

$$(4x^2 - 6x + 12) + (x^2 + 3x + 1)$$

- 2b. Add $-11x^3 + 7x^2 - 11x - 5$ and $16x^3 - 3x^2 + 3x - 15$ using a vertical format.

$$\begin{array}{r} -11x^3 + 7x^2 - 11x - 5 \\ +16x^3 - 3x^2 + 3x - 15 \\ \hline 5x^3 + 4x^2 - 8x - 20 \end{array}$$

- 2b. Add using a vertical format:

$$\begin{array}{r} 4x^3 - 6x^2 + 5x - 7 \\ -9x^3 \quad \quad - 4x + 3 \\ \hline \end{array}$$

Objective #3: Subtract polynomials.

 **Solved Problem #3**

- 3a. Subtract $3x^3 - 8x^2 - 5x + 6$ from

$$10x^3 - 5x^2 + 7x - 2.$$

$$\begin{aligned} &(10x^3 - 5x^2 + 7x - 2) - (3x^3 - 8x^2 - 5x + 6) \\ &= 10x^3 - 5x^2 + 7x - 2 - 3x^3 + 8x^2 + 5x - 6 \\ &= 10x^3 - 3x^3 - 5x^2 + 8x^2 + 7x + 5x - 2 - 6 \\ &= 7x^3 + 3x^2 + 12x - 8 \end{aligned}$$

 **Pencil Problem #3** 

- 3a. Subtract $y^2 - 8y + 9$ from $6y^3 + 2y^2 - y - 11$.

- 3b.** Use the method of subtracting in columns to find

$$(8y^3 - 10y^2 - 14y - 2) - (5y^3 - 3y + 6).$$

$$\begin{array}{r} 8y^3 - 10y^2 - 14y - 2 \\ - (5y^3 \qquad - 3y + 6) \\ \hline \end{array}$$

To subtract, add the opposite of the polynomial being subtracted.

$$\begin{array}{r} 8y^3 - 10y^2 - 14y - 2 \\ -5y^3 \qquad + 3y - 6 \\ \hline 3y^3 - 10y^2 - 11y - 8 \end{array}$$

- 3b.** Use a vertical format to subtract the polynomials.

$$\begin{array}{r} 7x^3 + 5x^2 - 3 \\ - (-2x^3 - 6x^2 + 5) \\ \hline \end{array}$$

Objective #4: Graph equations defined by polynomials of degree 2.

 **Solved Problem #4**

- 4.** Graph the equation $y = x^2 - 1$.
Make a table of values using integers from -3 to 3 .

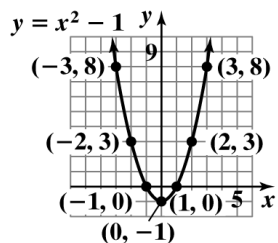
Table of values.

x	$y = x^2 - 1$	(x, y)
-3	$y = (-3)^2 - 1 = 8$	$(-3, 8)$
-2	$y = (-2)^2 - 1 = 3$	$(-2, 3)$
-1	$y = (-1)^2 - 1 = 0$	$(-1, 0)$
0	$y = (0)^2 - 1 = -1$	$(0, -1)$
1	$y = (1)^2 - 1 = 0$	$(1, 0)$
2	$y = (2)^2 - 1 = 3$	$(2, 3)$
3	$y = (3)^2 - 1 = 8$	$(3, 8)$

 **Pencil Problem #4** 

- 4.** Graph the equation $y = 4 - x^2$.
Make a table of values using integers from -3 to 3 .

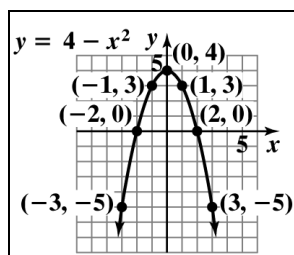
Plot the points and connect them with a smooth curve.



Answers for Pencil Problems (Textbook Exercise references in parentheses):

1. trinomial of degree 2 (5.1 #9)
 2a. $5x^2 - 3x + 13$ (5.1 #23) 2b. $-5x^3 - 6x^2 + x - 4$ (5.1 #47)
 3a. $6y^3 + y^2 + 7y - 20$ (5.1 #65) 3b. $9x^3 + 11x^2 - 8$ (5.1 #81)

x	$y = 4 - x^2$	(x, y)
-3	$y = 4 - (-3)^2 = -5$	$(-3, -5)$
-2	$y = 4 - (-2)^2 = 0$	$(-2, 0)$
-1	$y = 4 - (-1)^2 = 3$	$(-1, 3)$
0	$y = 4 - (0)^2 = 4$	$(0, 4)$
1	$y = 4 - (1)^2 = 3$	$(1, 3)$
2	$y = 4 - (2)^2 = 0$	$(2, 0)$
3	$y = 4 - (3)^2 = -5$	$(3, -5)$



4. (5.1 #93)

Homework:

- Review the Section 5.1 summary which begins on page 409 of the textbook.
- Insert your homework into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.