6.5 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. To find the difference between two polynomials, first change the _____ of each term in the second polynomial.
2. If there are multiple grouping symbols within an algebraic expression, begin working on the _____ pair of symbols first.
3. To add two or more polynomials, combine ____ terms.
4. A negative sign written in front of a polynomial in parentheses indicates the _____ of the entire polynomial.
5. To simplify algebraic expressions, apply the rules for order of operations just as if the _____ were numbers and proceed to combine like terms.
6. Like terms have the same _____ raised to the same _____.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. When subtracting one polynomial from another polynomial, only the first term of the polynomial is subtracted.
8. To simplify polynomials that are being added and subtracted, combine like terms.
9. The terms $6a^2$ and $7a^2$ are not like terms because they don't have the same coefficient.
10. Absolute value bars and radical signs are not considered grouping symbols.

Practice

Find the indicated sums. See Examples 1 through 3.

1. $\left(2x^2+5x-1\right)+\left(x^2+2x+3\right)$
2. $\left(x^2+3x-8\right)+\left(3x^2-2x+4\right)$
3. $\left(x^2+7x-7\right)+\left(x^2+4x\right)$
4. $\left(x^2+2x-3\right)+\left(x^2+5\right)$
5. $\left(2x^2-x-1\right)+\left(x^2+x+1\right)$
6. $\left(3x^2+5x-4\right)+\left(2x^2+x-6\right)$
7. $\left(-2x^2-3x+9\right)+\left(3x^2-2x+8\right)$
8. $\left(x^2+6x-7\right)+\left(3x^2+x-1\right)$
9. $\left(-4x^2+2x-1\right)+\left(3x^2-x+2\right)+\left(x-8\right)$
10. $\left(8x^2+5x+2\right)+\left(-3x^2+9x-4\right)+\left(2x^2+6\right)$
11. $\left(x^2+2x-1\right)+\left(3x^2-x+2\right)+\left(2x^3-4x-8\right)$
12. $\left(x^3+2x-9\right)+\left(x^2-5x+2\right)+\left(x^3-4x^2+1\right)$

13. $x^2 + 4x - 4$
$\underline{-2x^2 + 3x + 1}$

14. $2x^2 + 4x - 3$
$\underline{3x^2 - 9x + 2}$

15. $x^3 + 3x^2 + x$
$\underline{-2x^3 - x^2 + 2x - 4}$

16. $4x^3 + 5x^2 + 11$
$\underline{2x^3 - 2x^2 - 3x - 6}$

17. $7x^3 + 5x^2 + x - 6$
$-3x^2 + 4x + 11$
$\underline{-3x^3 - 2x^2 - 5x + 2}$

18. $x^3 + 5x^2 + 7x - 3$
$4x^2 + 3x - 9$
$\underline{4x^3 + 2x^2 - 2}$

19. $x^3 + 3x^2 - 4$
$7x^2 + 2x + 1$
$\underline{x^3 + x^2 - 6x}$

20. $x^3 + 2x^2 - 5$
$-2x^3 + x - 9$
$\underline{x^3 - 2x^2 + 14}$

Find the indicated differences. See Examples 4 through 6.

21. $(2x^2 + 4x + 8) - (x^2 + 3x + 2)$

22. $(3x^2 + 7x - 6) - (x^2 + 2x + 5)$

23. $(x^2 - 9x + 2) - (4x^2 - 3x + 4)$

24. $(6x^2 + 11x + 2) - (4x^2 - 2x - 7)$

25. $(2x^2 - x - 10) - (-x^2 + 3x - 2)$

26. $(7x^2 + 4x - 9) - (-2x^2 + x - 9)$

27. $(x^4 + 8x^3 - 2x^2 - 5) - (2x^4 + 10x^3 - 2x^2 + 11)$

28. $(x^3 + 4x^2 - 3x - 7) - (3x^3 + x^2 + 2x + 1)$

29. $(-3x^4 + 2x^3 - 7x^2 + 6x + 12) - (x^4 + 9x^3 + 4x^2 + x - 1)$

30. $(2x^5 + 3x^3 - 2x^2 + x - 5) - (3x^5 - 2x^3 + 5x^2 + 6x - 1)$

31. $(9x^2 - 5) - (13x^2 - 6x - 6)$

32. $(8x^2 + 9) - (4x^2 - 3x - 2)$

33. $(3x^4 - 2x^3 - 8x - 1) - (5x^3 - 3x^2 - 3x - 10)$

34. $(x^5 + 6x^3 - 3x^2 - 5) - (2x^5 + 8x^3 + 5x + 17)$

35. $14x^2 - 6x + 9$
$\underline{-(8x^2 + x - 9)}$

36. $9x^2 - 3x + 2$
$\underline{-(4x^2 - 5x - 1)}$

37. $5x^4 + 8x^2 + 11$
$\underline{-(-3x^4 + 2x^2 - 4)}$

38. $11x^2 + 5x - 13$
$\underline{-(-3x^2 + 5x + 2)}$

39. $x^3 + 6x^2 - 3$
$\underline{-(-x^3 + 2x^2 - 3x + 7)}$

40. $3x^3 + 9x - 17$
$\underline{-(x^3 + 5x^2 - 2x - 6)}$

Simplify each of the following expressions. See Examples 7 and 8.

41. $5x+2(x-3)-(3x+7)$

42. $-4(x-6)-(8x+2)-3x$

43. $11+\left[3x-2(1+5x)\right]$

44. $2+\left[9x-4(3x+2)\right]$

45. $8x-\left[2x+4(x-3)-5\right]$

46. $17-\left[-3x+6(2x-3)+9\right]$

47. $3x^3-\left[5-7(x^2+2)-6x^2\right]$

48. $10x^3-\left[8-5(3-2x^2)-7x^2\right]$

49. $(2x^2+4)-\left[-8+2(7-3x^2)+x\right]$

50. $-\left[6x^2-3(4+2x)+9\right]-(x^2+5)$

51. $2\left[3x+(x-8)-(2x+5)\right]-(x-7)$

52. $3\left[x+(10-3x)-(8-3x)\right]+(2x-1)$

53. $(x^2-1)+2\left[4+(3-x)\right]$

54. $(4-x^2)+3\left[(2x-3)-5\right]$

55. $-(x-5)+\left[6x-2(4-x)\right]$

56. $2(2x+1)-\left[5x-(2x+3)\right]$

Complete the following word problems.

57. Find the sum of $4x^2-3x$ and $6x+5$.

58. Subtract $2x^2-4x$ from $7x^3+5x$.

59. Subtract $3(x+1)$ from $5(2x-3)$.

60. Find the sum of $10x-2(3x+5)$ and $3(x-4)+16$.

61. Subtract $3x^2-4x+2$ from the sum of $4x^2+x-1$ and $6x-5$.

62. Subtract $-2x^2+6x+12$ from the sum of $2x^2+3x-1$ and $x^2-13x+2$.

63. Add $5x^3-8x+1$ to the difference between $2x^3+14x-3$ and x^2+6x+5.

64. Add $2x^3+4x^2+1$ to the difference between $-x^2+10x-3$ and x^3+2x^2+4x.

Applications

Solve.

65. A manufacturer estimates that it costs $2x^3 + 4x^2 - 35$ dollars to create the amount of items it would take to fill a box which has a side length of x feet. The warehouse manager determines it will cost $1.50x^3 + 5$ dollars to store each box for one month.

a. Add the two polynomials to determine the manufacturing and storage costs for each box of items for one month.

b. The warehouse manager knows that each box will be stored for an average of 3 months. Determine the cost to produce a box of items and store it for 3 months.

c. If the box has a side length of 4 feet, use the expression from part b. to determine how much will it cost to create and store a box of items for 3 months.

66. Carson has two loans, a loan for his car and a home equity loan that he used for home improvements. The car loan is for $15,000 and Carson plans to make monthly payments of $500 per month. The home improvement loan is for $9000 and Carson plans to make monthly payments of $300.

a. Write an algebraic expression to describe the value of the car loan after x months.

b. Write an algebraic expression to describe the value of the home equity loan after x months.

c. Add together the two algebraic expressions to determine the remaining loan amount to be paid after x months for both loans combined.

d. How much will Carson still owe on both loans after 10 months?

67. A company estimates that the revenue from selling x items is $58x$ dollars and the cost of producing x items is $31x + 40$ dollars.

a. The company's profit is defined as revenue minus cost. Find the expression that models the profit of producing and selling x items.

b. What is the profit from producing and selling 12 items?

68. Keri's gym membership costs $30 a month plus $6 for every class she takes. To cut back on her spending, she is thinking of switching to a gym that costs $20 a month plus $4 for every class she takes.

a. Write an algebraic expression that describes how much Keri is currently paying per month if she takes x classes.

b. Write an algebraic expression that describes how much Keri would pay per month at the new gym if she took x classes.

c. Write an algebraic expression that describes Keri's savings per month if she switches gyms.

d. How much would Keri save the first month if she switches gyms and takes 10 classes?

Writing & Thinking

69. Explain, in your own words, how to subtract one polynomial from another.

70. Give two examples that show how the sum of two binomials might not be a binomial.