

# 5.5 Exercise Set

FOR EXTRA HELP



**Concept Reinforcement** In each of Exercises 1–8, match the polynomial with one of its factors from the column on the right.

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|----------------------|-----|-------------|
| 1. $2x^2 - 7x - 15$  | (f) | a) $5x + 2$ |
| 2. $3x^2 + 4x - 7$   | (c) | b) $5x + 3$ |
| 3. $6x^2 + 7x + 2$   | (e) | c) $3x + 7$ |
| 4. $10x^2 - x - 2$   | (a) | d) $2x + 7$ |
| 5. $3x^2 + 4x - 15$  | (g) | e) $3x + 2$ |
| 6. $2x^2 + 9x + 7$   | (d) | f) $2x + 3$ |
| 7. $10x^2 + 9x - 7$  | (h) | g) $3x - 5$ |
| 8. $15x^2 + 14x + 3$ | (b) | h) $5x + 7$ |

Factor completely. If a polynomial is prime, state this.

- |  |  |
|--|--|
| 9. $2x^2 + 7x - 4$<br>$(2x - 1)(x + 4)$              | 10. $3x^2 + x - 4$<br>$(3x + 4)(x - 1)$                  |
| 11. $3x^2 - 17x - 6$<br>$(3x + 1)(x - 6)$            | 12. $5x^2 - 19x - 4$<br>$(5x + 1)(x - 4)$                |
| 13. $15a^2 - 14a + 3$<br>$(5a - 3)(3a - 1)$          | 14. $3a^2 - 10a + 8$<br>$(3a - 4)(a - 2)$                |
| 15. $6t^2 + 17t + 7$<br>$(2t + 1)(3t + 7)$           | 16. $9a^2 + 18a + 8$<br>$(3a + 2)(3a + 4)$               |
| 17. $6x^2 - 10x - 4$<br>$2(3x + 1)(x - 2)$           | 18. $15t^2 + 20t - 75$<br>$5(3t - 5)(t + 3)$             |
| 19. $8x^2 - 16 - 28x$<br>$4(x - 4)(2x + 1)$          | 20. $18x^2 - 24 - 6x$<br>$6(3x - 4)(x + 1)$              |
| 21. $14x^4 - 19x^3 - 3x^2$<br>$x^2(2x - 3)(7x + 1)$  | 22. $70x^4 - 68x^3 + 16x^2$<br>$2x^2(5x - 2)(7x - 4)$    |
| 23. $10^2 - 23x + 12x^2$<br>$(4x - 5)(3x - 2)$       | 24. $x - 15 + 2x^2$<br>$(2x - 5)(x + 3)$                 |
| 25. $9x^2 + 15x + 4$<br>$(3x + 4)(3x + 1)$           | 26. $6y^2 - y - 2$<br>$(3y - 2)(2y + 1)$                 |
| 27. $4x^2 + 15x + 9$<br>$(4x + 3)(x + 3)$            | 28. $2y^2 + 7y + 6$<br>$(2y + 3)(y + 2)$                 |
| 29. $4 + 6t^2 - 13t$ Prime                           | 30. $2t^2 - 19 - 6t$ Prime                               |
| 31. $-8t^2 - 8t + 30$<br>$-2(2t - 3)(2t + 5)$        | 32. $-36a^2 + 21a - 3$<br>$-3(4a - 1)(3a - 1)$           |
| 33. $8 - 6z - 9z^2$ □                                | 34. $3 + 35a - 12a^2$ □                                  |
| 35. $18xy^3 + 3xy^2 - 10xy$<br>$xy(6y^2 + 3y - 10)$  | 36. $3x^3y^2 - 5x^2y^2 - 2xy^2$<br>$xy^2(3x^2 - 5x - 2)$ |
| 37. $24x^2 - 2 - 47x$<br>$(x - 2)(24x + 1)$          | 38. $15z^2 - 10 - 47z$<br>$(5z + 1)(3z - 10)$            |
| 39. $63x^3 + 111x^2 + 36x$<br>$3x(7x + 3)(3x + 4)$   | 40. $50t^3 + 115t^2 + 60t$<br>$5t(5t + 4)(2t + 3)$       |
| 41. $48x^4 + 4x^3 - 30x^2$<br>$2x^2(4x - 3)(6x + 5)$ | 42. $40y^4 + 4y^2 - 12$<br>$4(5y^2 + 3)(2y^2 - 1)$       |
| 43. $12a^2 - 17ab + 6b^2$<br>$(4a - 3b)(3a - 2b)$    | 44. $20a^2 - 23ax + 6x^2$<br>$(4a - 3x)(5a - 2x)$        |
| 45. $2x^2 + xy - 6y^2$<br>$(2x - 3y)(x + 2y)$        | 46. $8m^2 - 6mn - 9n^2$<br>$(4m + 3n)(2m - 3n)$          |
| 47. $8s^2 + 22st + 14t^2$<br>$2(s + t)(4s + 7t)$     | 48. $10s^2 + 4st - 6t^2$<br>$2(5s - 3t)(s + t)$          |

□ Answers to Exercises 33, 34, 49, 71, and 72 are on pp. IA-12 and IA-13.

49.  $9x^2 - 30xy + 25y^2$  □  $(2p + 3q)(2p + 3q)$ , or  $(2p + 3q)^2$
50.  $4p^2 + 12pq + 9q^2$
51.  $9x^2y^2 + 5xy - 4$   
 $(9xy^2 - 4)(xy + 1)$
52.  $7a^2b^2 + 13ab + 6$   
 $(7ab + 6)(ab + 1)$
53. Use the results of Exercise 33 to solve  $9z^2 + 6z = 8$ .  
 $-\frac{4}{3}, \frac{2}{3}$
54. Use the results of Exercise 34 to solve  $3 + 35a = 12a^2$ .  
 $-\frac{1}{12}, 3$
55. Use the results of Exercise 39 to solve  $63x^3 + 111x^2 + 36x = 0$ .  
 $-\frac{4}{3}, -\frac{3}{7}, 0$
56. Use the results of Exercise 40 to solve  $50t^3 + 115t^2 + 60t = 0$ .  
 $-\frac{3}{2}, -\frac{4}{5}, 0$

Solve.

57.  $3x^2 - 8x + 4 = 0$   $\frac{2}{3}, 2$
58.  $9x^2 - 15x + 4 = 0$   $\frac{1}{3}, \frac{4}{3}$
59.  $4t^3 + 11t^2 + 6t = 0$   $-2, -\frac{3}{4}, 0$
60.  $8n^3 + 10n^2 + 3n = 0$   $-\frac{3}{4}, -\frac{1}{2}, 0$
61.  $6x^2 = 13x + 5$   $-\frac{1}{3}, \frac{5}{2}$
62.  $40x^2 + 43x = 6$   $-\frac{6}{5}, \frac{1}{8}$
63.  $x(5 + 12x) = 28$   $-\frac{7}{4}, \frac{4}{3}$
64.  $a(1 + 21a) = 10$   $-\frac{5}{7}, \frac{2}{3}$
65. Find the zeros of the function given by  $f(x) = 2x^2 - 13x - 7$ .  
 $-\frac{1}{2}, 7$
66. Find the zeros of the function given by  $g(x) = 6x^2 + 13x + 6$ .  
 $-\frac{3}{2}, -\frac{2}{3}$
67. Let  $f(x) = x^2 + 12x + 40$ . Find all values of  $a$  for which  $f(a) = 8$ .  
 $-8, -4$
68. Let  $f(x) = x^2 + 14x + 50$ . Find all values of  $a$  for which  $f(a) = 5$ .  
 $-9, -5$
69. Let  $g(x) = 2x^2 + 5x$ . Find all values of  $a$  for which  $g(a) = 12$ .  
 $-4, \frac{3}{2}$
70. Let  $g(x) = 2x^2 - 15x$ . Find all values of  $a$  for which  $g(a) = -7$ .  
 $\frac{1}{2}, 7$

Find the domain of the function  $f$  given by each of the following.

71.  $f(x) = \frac{3}{x^2 - 4x - 5}$  □
72.  $f(x) = \frac{2}{x^2 - 7x + 6}$  □

73.  $f(x) = \frac{x-5}{9x-18x^2}$  □

74.  $f(x) = \frac{1+x}{3x-15x^2}$  □

75.  $f(x) = \frac{3x}{2x^2-9x+4}$  □

76.  $f(x) = \frac{-x}{6x^2+13x+6}$  □

77.  $f(x) = \frac{7}{5x^3-35x^2+50x}$  □

78.  $f(x) = \frac{3}{2x^3-2x^2-12x}$  □

- TW 79. Asked to factor
- $4x^2 + 28x + 48$
- , Aziz
- incorrectly*
- answers

$$4x^2 + 28x + 48 = (2x + 6)(2x + 8) \\ = 2(x + 3)(x + 4).$$

If this were a 10-point quiz question, how many points would you take off? Why?

- TW 80. Austin says that the domain of the function

$$F(x) = \frac{x+3}{3x^2-x-2}$$

is  $\{-\frac{2}{3}, 1\}$ . Is he correct? Why or why not?

### SKILL REVIEW

To prepare for Section 5.6, review the special products in Section 5.2.

Multiply. [5.2]

81.  $(x-2)^2 = x^2 - 4x + 4$  82.  $(x+2)^2 = x^2 + 4x + 4$

83.  $(x+2)(x-2) = x^2 - 4$  84.  $(5t-3)^2 = 25t^2 - 30t + 9$

85.  $(4a+1)^2 = 16a^2 + 8a + 1$  86.  $(2n+7)(2n-7) = 4n^2 - 49$

87.  $(3c-10)^2 = 9c^2 - 60c + 100$  88.  $(1-5a)^2 = 1 - 10a + 25a^2$

89.  $(8n+3)(8n-3) = 64n^2 - 9$  90.  $(9-y)(9+y) = 81 - y^2$

### SYNTHESIS

- TW 91. Explain how you would prove to a fellow student that a given trinomial is prime.

- TW 92. Tori has factored a polynomial as
- $(a-b)(x-y)$
- , while Tracy has factored the same polynomial as
- $(b-a)(y-x)$
- . Can both be correct? Why or why not?

Use a graph to help factor each polynomial.

93.  $4x^2 + 120x + 675 = (2x+15)(2x+45)$

94.  $4x^2 + 164x + 1197 = (2x+63)(2x+19)$

95.  $3x^3 + 150x^2 - 3672x = 3x(x+68)(x-18)$

96.  $5x^4 + 20x^3 - 1600x^2 = 5x^2(x+20)(x-16)$

Solve.

97.  $(8x+11)(12x^2-5x-2) = 0$   $-\frac{11}{8}, -\frac{1}{4}, \frac{2}{3}$

98.  $(x+1)^3 = (x-1)^3 + 26$   $-2, 2$

99.  $(x-2)^3 = x^3 - 2$   $1$

Factor. Assume that variables in exponents represent positive integers. If a polynomial is prime, state this.

100.  $9x^2y^2 - 12xy - 2$  Prime

101.  $18a^2b^2 - 3ab - 10 = (3ab+2)(6ab-5)$

102.  $16x^2y^3 + 20xy^2 + 4y = 4y(4xy+1)(xy+1)$

103.  $16a^2b^3 + 25ab^2 + 9$  Prime

104.  $9t^8 + 12t^4 + 4 = (3t^4+2)^2$

105.  $25t^{10} - 10t^5 + 1 = (5t^5-1)^2$

106.  $-15x^{2m} + 26x^m - 8 = -(5x^m-2)(3x^m-4)$

107.  $20x^{2n} + 16x^n + 3 = (10x^n+3)(2x^n+1)$

108.  $3(a+1)^{n+1}(a+3)^2 - 5(a+1)^n(a+3)^3$  □

109.  $7(t-3)^{2n} + 5(t-3)^n - 2$  □

110.  $6(x-7)^2 + 13(x-7) - 5 = (2x-9)(3x-22)$

111.  $2a^4b^6 - 3a^2b^3 - 20 = (2a^2b^3+5)(a^2b^3-4)$

112.  $5x^8y^6 + 35x^4y^3 + 60 = 5(x^4y^3+4)(x^4y^3+3)$

113. To better understand factoring
- $ax^2 + bx + c$
- by the
- $ac$
- method, suppose that

$$ax^2 + bx + c = (mx+r)(nx+s).$$

Show that if  $P = ms$  and  $Q = rn$ , then  $P + Q = b$  and  $PQ = ac$ . □

### Try Exercise Answers: Section 5.5

9.  $(2x-1)(x+4)$  17.  $2(3x+1)(x-2)$

19.  $4(x-4)(2x+1)$  21.  $x^2(2x-3)(7x+1)$

59.  $-2, -\frac{3}{4}, 0$  69.  $-4, \frac{3}{2}$  71.  $\{x \mid x \text{ is a real number and } x \neq 5 \text{ and } x \neq -1\}$