Factor each of the following trinomials. See Examples 1–9.

1. $c^2 + 4c - 5$ **2.** $d^2 + 9d + 8$ **3.** $p^2 + 6p + 8$ **4.** $m^2 + 15m + 56$

5. $a^2 - a - 12$ **6.** $z^2 + 2z - 35$ **7.** $r^2 - r - 20$ **8.** $y^2 - 2y - 35$

9. $x^2 - 3x - 40$ **10.** $a^2 - 6a - 16$ **11.** $k^2 - kn - 6n^2$ **12.** $a^2 + 3ab - 18b^2$

13. $y^2 - 3yx - 10x^2$ **14.** $p^2 - 2pq - 15q^2$ **15.** $a^2b^2 - 7ab + 12$ **16.** $y^2w^2 + 4yw - 21$

17. $5y^2 + y - 6$ **18.** $2r^2 - r - 3$ **19.** $3m^2 + 7m + 2$ **20.** $3y^2 + 14y + 8$

21. $8y^2 + 13y - 6$ **22.** $6x^2 + 13x + 6$ **23.** $18x^2 - 3x - 10$ **24.** $12m^2 - 8m - 15$

25. $35p^2 - 4p - 15$ **26.** $6m^2 - 17m - 14$ **27.** $12a^2 + 8ab - 15b^2$ **28.** $3m^2 + 7mk + 2k^2$

29. $4k^2 - 12ka + 9a^2$ **30.** $18a^2 - 3ab - 28b^2$ **31.** $35x^2 - 41xy - 24y^2$ **32.** $10a^2 + ab - 3b^2$

33. $8m^2 - 14mp - 39p^2$ **34.** $6x^2 - 5xy - 39y^2$ **35.** $6k^2p^2 + 13kp + 6$ **36.** $15z^2x^2 - 22zx - 5$

37. $12m^2 + 14m - 40$ **38.** $36t^2 + 30t - 50$ **39.** $18a^2 - 15a - 18$ **40.** $100r^2 - 90r + 20$

41. $6a^3 + 12a^2 - 90a$ **42.** $3m^4 + 6m^3 - 72m^2$ **43.** $13y^3 + 39y^2 - 52y$ **44.** $4p^3 + 24p^2 - 64p$

45. $2x^3y^3 - 48x^2y^4 + 288xy^5$ **46.** $6m^3n^2 - 24m^2n^3 - 30mn^4$

Factor each of the following. See Examples 10 and 11.

47. $3x^4 - 14x^2 - 5$ **48.** $3p^4 - 8p^2 - 3$ **49.** $z^4 - 7z^2 - 30$

50. $k^4 + k^2 - 12$ **51.** $6x^4 + 5x^2 - 25$ **52.** $6a^4 - 11a^2 - 10$

53. $12p^4 + 28p^2r - 5r^2$ **54.** $2y^4 + xy^2 - 6x^2$

55. $4x^4 + 33x^2a^2 - 27a^4$ **56.** $2p^4 + 31p^2q^2 - 16q^4$

Find a polynomial that can be factored as follows.

57. $(3q + 7h)(q - 2h)$ **58.** $(5p - 2q)(3p + 4q)$

59. $-9a(a - 5b)(2a + 7b)$ **60.** $12z^2(5z + x)(2z - x)$

Factor each of the following. Assume that all variables used as exponents represent positive integers. See Examples 10 and 11.

61. $6(p + 3)^2 + 13(p + 3) + 5$ **62.** $10(m - 5)^2 - 9(m - 5) - 9$

63. $6(z + k)^2 - 7(z + k) - 5$ **64.** $3(r + m)^2 - 10(r + m) - 25$

65. $a^2(a + b)^2 - ab(a + b)^2 - 6b^2(a + b)^2$ **66.** $m^2(m - p) + mp(m - p) - 2p^2(m - p)$

67. $p^2(p + q) + 4pq(p + q) + 3q^2(p + q)$ **68.** $2k^2(5 - y) - 7k(5 - y) + 5(5 - y)$

69. $z^2(z - x) - zx(x - z) - 2x^2(z - x)$ **70.** $r^2(r - s) - 5rs(s - r) - 6s^2(r - s)$

71. $p^{2n} - p^n - 6$ **72.** $k^{2y} + 4k^y - 5$

73. $6z^{4r} - 5z^{2r} - 4$ **74.** $12a^{4p} + 11a^{2p} + 2$

75. $36k^{3r} + 30k^{2r} + 4k^r$ **76.** $30y^{7a} - 26y^{6a} - 40y^{5a}$

Review Exercises *Simplify. See Section 3.2.*

77. -5^0 **78.** $\left(\frac{5}{4}\right)^{-2}$ **79.** $\frac{(m^2p)^{-1}}{mp^2}$ **80.** $\frac{(2rs)^3}{(r^{-1}s)^2}$

Find each product. See Section 3.4.

81. $(2m - 5)(2m + 5)$ **82.** $(3p + 2q)(3p - 2q)$ **83.** $(5a - 3b)^2$

84. $(2z + 5x)^2$ **85.** $(y - 2)(y^2 + 2y + 4)$ **86.** $(5a + 3)(25a^2 - 15a + 9)$

Section 3.6 (page 133)

1. $(c + 5)(c - 1)$ **3.** $(p + 2)(p + 4)$ **5.** $(a - 4)(a + 3)$ **7.** $(r + 4)(r - 5)$
9. $(x - 8)(x + 5)$ **11.** $(k - 3n)(k + 2n)$ **13.** $(y - 5x)(y + 2x)$ **15.** $(ab - 3)(ab - 4)$
17. $(5y + 6)(y - 1)$ **19.** $(3m + 1)(m + 2)$ **21.** $(8y - 3)(y + 2)$ **23.** $(3x + 2)(6x - 5)$
25. $(7p - 5)(5p + 3)$ **27.** $(6a - 5b)(2a + 3b)$ **29.** $(2k - 3a)(2k - 3a)$ or $(2k - 3a)^2$
31. $(7x + 3y)(5x - 8y)$ **33.** $(2m + 3p)(4m - 13p)$ **35.** $(3kp + 2)(2kp + 3)$
37. $2(3m - 4)(2m + 5)$ **39.** $3(2a - 3)(3a + 2)$ **41.** $6a(a - 3)(a + 5)$
43. $13y(y + 4)(y - 1)$ **45.** $2xy^3(x - 12y)(x - 12y)$ or $2xy^3(x - 12y)^2$ **47.** $(3x^2 + 1)(x^2 - 5)$
49. $(z^2 + 3)(z^2 - 10)$ **51.** $(3x^2 - 5)(2x^2 + 5)$ **53.** $(6p^2 - r)(2p^2 + 5r)$
55. $(4x^2 - 3a^2)(x^2 + 9a^2)$ **57.** $3q^2 + qh - 14h^2$ **59.** $-18a^3 + 27a^2b + 315ab^2$
61. $(3p + 14)(2p + 7)$ **63.** $(3z + 3k - 5)(2z + 2k + 1)$ **65.** $(a + b)^2(a - 3b)(a + 2b)$
67. $(p + q)(p + 3q)(p + q)$ or $(p + q)^2(p + 3q)$ **69.** $(z - x)(z - x)(z + 2x)$ or $(z - x)^2(z + 2x)$
71. $(p^n - 3)(p^n + 2)$ **73.** $(2z^{2r} + 1)(3z^{2r} - 4)$ **75.** $2k^r(6k^r + 1)(3k^r + 2)$ **77.** -1
79. $1/(m^3p^3)$ **81.** $4m^2 - 25$ **83.** $25a^2 - 30ab + 9b^2$ **85.** $y^3 - 8$