In Exercises 47–84, multiply or find the special product.

47. $(x + 3)(x + 4)$
48. $(x - 5)(x + 10)$
49. $(3x - 5)(2x + 1)$
50. $(7x - 2)(4x - 3)$
51. $(x^2 - x + 1)(x^2 + x + 1)$
52. $(x^2 + 3x - 2)(x^2 - 3x - 2)$
53. $(x + 10)(x - 10)$
54. $(2x + 3)(2x - 3)$
55. $(x + 2y)(x - 2y)$
56. $(2x + 3y)(2x - 3y)$
57. $(2x + 3)^2$
58. $(4x + 5)^2$
59. $(2x - 5y)^2$
60. $(5 - 8x)^2$
61. $(x + 1)^3$
62. $(x - 2)^3$
63. $(2x - y)^3$
64. $(3x + 2y)^3$
65. $(4x^3 - 3)^2$
66. $(8x + 3)^2$
67. $[(m - 3) + n][(m - 3) - n]$
68. $[(x + y) + 1][(x + y) - 1]$
69. $[(x - 3) + y]^2$
70. $[(x + 1) - y]^2$
71. $(2r^2 - 5)(2r^2 + 5)$
72. $(3a^3 - 4b^2)(3a^3 + 4b^2)$
73. $\left(\frac{1}{2}x - 3\right)^2$
74. $\left(\frac{2}{3}t + 5\right)^2$
75. $\left(\frac{1}{3}x - 2\right)\left(\frac{1}{3}x + 2\right)$
76. $\left(2x + \frac{1}{5}\right)\left(2x - \frac{1}{5}\right)$
77. $(1.2x + 3)^2$
78. $(1.5y - 3)^2$
79. $(1.5x - 4)(1.5x + 4)$
80. $(2.5y + 3)(2.5y - 3)$
81. $5x(x + 1) - 3x(x + 1)$
82. $(2x - 1)(x + 3) + 3(x + 3)$
83. $(u + 2)(u - 2)(u^2 + 4)$
84. $(x + y)(x - y)(x^2 + y^2)$

In Exercises 85–88, find the product. (The expressions are not polynomials, but the formulas can still be used.)

85. $(\sqrt{x} + \sqrt{y})(\sqrt{x} - \sqrt{y})$
86. $(5 + \sqrt{x})(5 - \sqrt{x})$
87. $(x - \sqrt{5})^2$
88. $(x + \sqrt{3})^2$

In Exercises 89–96, factor out the common factor.

89. $3x + 6$
90. $5y - 30$
91. $2x^3 - 6x$
92. $4x^3 - 6x^2 + 12x$
93. $x(x - 1) + 6(x - 1)$
94. $3x(x + 2) - 4(x + 2)$
95. $(x + 3)^2 - 4(x + 3)$
96. $(3x - 1)^2 + (3x - 1)$

In Exercises 97–102, find the greatest common factor such that the remaining factors have only integer coefficients.

97. $\frac{1}{2}x + 4$
98. $\frac{1}{3}y + 5$
99. $\frac{1}{2}x^3 + 2x^2 - 5x$
100. $\frac{1}{3}y^4 - 5y^2 + 2y$
101. $\frac{2}{3}x(x - 3) - 4(x - 3)$
102. $\frac{4}{5}y(y + 1) - 2(y + 1)$

In Exercises 103–112, completely factor the difference of two squares.

103. $x^2 - 81$
104. $x^2 - 49$
105. $32y^2 - 18$
106. $4 - 36y^2$
107. $16x^2 - \frac{1}{9}$
108. $\frac{4}{25}y^2 - 64$
109. $(x - 1)^2 - 4$
110. $25 - (z + 5)^2$
111. $9u^2 - 4v^2$
112. $25x^2 - 16y^2$

In Exercises 113–122, factor the perfect square trinomial.

113. $x^2 - 4x + 4$
114. $x^2 + 10x + 25$
115. $4t^2 + 4t + 1$
116. $9x^2 - 12x + 4$
117. $25y^2 - 10y + 1$
118. $36y^2 - 108y + 81$
119. $9u^2 + 24uv + 16v^2$
120. $4x^2 - 4xy + y^2$
121. $x^2 - \frac{4}{3}x + \frac{4}{9}$
122. $z^2 + z + \frac{1}{4}$

In Exercises 123–130, factor the sum or difference of cubes.

123. $x^3 - 8$
124. $x^3 - 27$
125. $y^3 + 64$
126. $z^3 + 125$
127. $8t^3 - 1$
128. $27x^3 + 8$
129. $u^3 + 27v^3$
130. $64x^3 - y^3$

In Exercises 131–144, factor the trinomial.

131. $x^2 + x - 2$
132. $x^2 + 5x + 6$
133. $s^2 - 5s + 6$
134. $t^2 - t - 6$
135. $20 - y - y^2$
136. $24 + 5z - z^2$
137. $x^2 - 30x + 200$
138. $x^2 - 13x + 42$
139. $3x^2 - 5x + 2$
140. $2x^2 - x - 1$
141. $5x^2 + 26x + 5$
142. $12x^2 + 7x + 1$
143. $-9z^2 + 3z + 2$
144. $-5u^2 - 13u + 6$

In Exercises 145–152, factor by grouping.

145. $x^3 - x^2 + 2x - 2$
146. $x^3 + 5x^2 - 5x - 25$
147. $2x^3 - x^2 - 6x + 3$
148. $5x^3 - 10x^2 + 3x - 6$
149. $6 + 2x - 3x^3 - x^4$
150. $x^5 + 2x^3 + x^2 + 2$
151. $6x^3 - 2x + 3x^2 - 1$
152. $8x^5 - 6x^2 + 12x^3 - 9$

In Exercises 153–158, factor the trinomial by grouping.

153. $3x^2 + 10x + 8$
154. $2x^2 + 9x + 9$
155. $6x^2 + x - 2$
156. $6x^2 - x - 15$
157. $15x^2 - 11x + 2$
158. $12x^2 - 13x + 1$

In Exercises 159–192, completely factor the expression.

159. $6x^2 - 54$

160. $12x^2 - 48$

161. $x^3 - 4x^2$

162. $x^3 - 9x$

163. $x^2 - 2x + 1$

164. $16 + 6x - x^2$

165. $1 - 4x + 4x^2$

166. $-9x^2 + 6x - 1$

167. $2x^2 + 4x - 2x^3$

168. $2y^3 - 7y^2 - 15y$

169. $9x^2 + 10x + 1$

170. $13x + 6 + 5x^2$

171. $\frac{1}{81}x^2 + \frac{2}{9}x - 8$

172. $\frac{1}{8}x^2 - \frac{1}{96}x - \frac{1}{16}$

173. $3x^3 + x^2 + 15x + 5$

174. $5 - x + 5x^2 - x^3$

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

176. $3u - 2u^2 + 6 - u^3$

177. $\frac{1}{4}x^3 + 3x^2 + \frac{3}{4}x + 9$

178. $\frac{1}{5}x^3 + x^2 - x - 5$

179. $(t - 1)^2 - 49$

180. $(x^2 + 1)^2 - 4x^2$

181. $(x^2 + 8)^2 - 36x^2$

182. $2t^3 - 16$

183. $5x^3 + 40$

184. $4x(2x - 1) + (2x - 1)^2$

185. $5(3 - 4x)^2 - 8(3 - 4x)(5x - 1)$

186. $2(x + 1)(x - 3)^2 - 3(x + 1)^2(x - 3)$

187. $7(3x + 2)^2(1 - x)^2 + (3x + 2)(1 - x)^3$

188. $7x(2)(x^2 + 1)(2x) - (x^2 + 1)^2(7)$

189. $3(x - 2)^2(x + 1)^4 + (x - 2)^3(4)(x + 1)^3$

190. $2x(x - 5)^4 - x^2(4)(x - 5)^3$

191. $5(x^6 + 1)^4(6x^5)(3x + 2)^3 + 3(3x + 2)^2(3)(x^6 + 1)^5$

192. $\frac{x^2}{2}(x^2 + 1)^4 - (x^2 + 1)^5$

In Exercises 193–196, find all values of b for which the trinomial can be factored.

193. $x^2 + bx - 15$

194. $x^2 + bx + 50$

195. $x^2 + bx - 12$

196. $x^2 + bx + 24$

In Exercises 197–200, find two integer values of c su the trinomial can be factored. (There are many answers.)

197. $2x^2 + 5x + c$

198. $3x^2 - 10x + c$

199. $3x^2 - x + c$

200. $2x^2 + 9x + c$

201. ***Cost, Revenue, and Profit*** An electronics manuf can produce and sell x radios per week. The total (in dollars) of producing x radios is

$$C = 73x + 25{,}000$$

and the total revenue R (in dollars) is

$$R = 95x.$$

(a) Find the profit P in terms of x.

(b) Find the profit obtained by selling 5000 radio week.

202. ***Cost, Revenue, and Profit*** An artisan can produce sell x hats per month. The total cost C (in dollar producing x hats is

$$C = 460 + 12x$$

and the total revenue R (in dollars) is

$$R = 36x.$$

(a) Find the profit P in terms of x.

(b) Find the profit obtained by selling 42 hats per mo

203. ***Compound Interest*** After 2 years, an investment $500 compounded annually at an interest rate r will yi an amount of $500(1 + r)^2$.

(a) Write this polynomial in standard form.

(b) Use a calculator to evaluate the polynomial for t values of r shown in the table.

r	$2\frac{1}{2}\%$	3%	4%	$4\frac{1}{2}\%$	5%
$500(1 + r)^2$					

(c) What conclusion can you make from the table?

204. ***Compound Interest*** After 3 years, an investment o $1200 compounded annually at an interest rate r wil yield an amount of $1200(1 + r)^3$.

(a) Write this polynomial in standard form.

(b) Use a calculator to evaluate the polynomial for the values of r shown in the table.

r	2%	3%	$3\frac{1}{2}\%$	4%	$4\frac{1}{2}\%$
$1200(1 + r)^3$					

(c) What conclusion can you make f