Perform the indicated operation and reduce to lowest terms.

1. $\frac{9}{5} \cdot \frac{10}{18}$

2. $\frac{8}{3} \cdot \frac{12}{5}$

3. $\frac{5}{2} \cdot \frac{3}{5}$

4. $\frac{6}{7} \cdot \frac{7}{2}$

5. $\frac{12}{\frac{1}{2}}$

6. $\frac{3+\frac{1}{2}}{14}$

7. $\frac{4+\frac{1}{4}}{3+\frac{1}{2}}$

8. $\frac{2+\frac{1}{5}}{6+\frac{4}{5}}$

9. $\frac{4}{5} + \frac{8}{7}$

10. $\frac{2+\frac{1}{3}}{3+\frac{1}{4}}$

11. $\frac{1}{3} - \frac{1}{4}$

12. $\frac{8}{3} - \frac{2}{7}$

13. $\frac{23}{7} - \frac{5}{3}$

14. $\frac{15}{4} - \frac{7}{3}$

15. $\frac{10}{3} - \frac{13}{5}$

Evaluate the given expression.

16. $\frac{4-3^2}{25-5^2}$

17. $\frac{6-4^2}{3^2-9}$

18. $\frac{2^2-4}{5}$

19. $\frac{3^2-4^2}{16}$

20. $\frac{5^2-2^2}{25}$

21. $[4-1(2+6)]-3$

22. $4+2[7-3(5-3)]$

23. $1+3[8+3(8-3)]$

24. $[4(7-4)-10]^2$

25. $[5(8-3)-20]^2$

Simplify: Write with positive exponents only. Assume all variables are greater than 0.

26. $(4x^3y^3)(9x^{-3}y^{-5})$

27. $(-7a^5b^2)(3a^2b^{-3})$

28. $(5a^4b^3)(-6a^9b^{-2})$

29. $(2ab)^3(3ab)^2$

30. $(5a^2b)^2(3a^{-1}b)^3$

31. $(-2a^2b^{-3}) \cdot (4a^3)^2$

32. $(3ab^4)(-2a^3)^2$

33. $(-3a^{-2}b)(4ab^3)^2$

34. $\dfrac{x^{-3}y^{-5}}{(x^5y)^{-2}}$

35. $\dfrac{x^3y^{-3}}{(x^{-4}y)^{-2}}$

36. $\dfrac{x^{-4}y^{-6}}{(x^4y)^2}$

37. $\dfrac{x^{-3}y^5}{(x^{-2}y)^2}$

38. $\dfrac{(x^2y)^{-6}}{(x^{-4}y)^2}$

39. $\dfrac{(x^4y)^{-3}}{(x^5y)^2}$

40. $\dfrac{(x^4y)^{-5}}{(x^4y)^2}$

41. $\dfrac{(x^2y)^{-4}}{(x^{-4}y)^2}$

42. $\left(\dfrac{a^{-3}b}{c}\right)^{-2}$

43. $\left(\dfrac{a^{-4}b^2}{c^{-3}}\right)^{-5}$

44. $\left(\dfrac{a^3b^4}{c^{-5}}\right)^{-2}$

45. $\left(\dfrac{4x^2y}{3y}\right)^{-3}$

46. $\left(\dfrac{12x^4y^{-3}}{x^{-1}}\right)^{-1}$

47. $\left(\dfrac{3x^{-2}y^{-1}}{2xy}\right)^{-2}$

48. $\left(\dfrac{10a^3b^{-2}}{5a^{-1}b^2}\right)^{-1}$

49. $\left(\dfrac{2b^{-2}}{3a^4}\right)^{-3}$

50. $\left(\dfrac{4x^{-3}y^2}{3xy^{-2}}\right)^{-2}$

Evaluate.

51. -3^2

52. $(-3)^2$

53. -4^3

54. $(-4)^3$

55. -2^4

56. $(-2)^4$

57. -3^4

58. $(-3)^4$

59. -2^5

60. $(-2)^5$

61. $16^{1/2}$

62. $27^{1/3}$

63. $-27^{1/3}$

64. $(-27)^{1/3}$

65. $-32^{1/5}$

66. $(-32)^{1/5}$

67. $-16^{1/4}$

68. $(-16)^{1/4}$

69. $-8^{4/3}$

70. $(-8)^{4/3}$

71. $-9^{3/2}$

72. $-9^{3/2}$

73. $16^{3/2}$

74. $36^{3/2}$

75. $\left(\frac{1}{9}\right)^{3/2}$

76. $27^{4/3}$

77. $81^{3/4}$

78. $\left(\frac{8}{27}\right)^{2/3}$

79. $4^{-5/2}$

80. $\left(\frac{8}{27}\right)^{-2/3}$

81. $4^{-3/2}$

82. $81^{-5/4}$

83. $4^{-3/2}$

84. $36^{-3/2}$

85. $25^{-3/2}$

Simplify. Write the expression using only positive exponents. Assume all variables are greater than 0.

86. $(3x^{2/3})(2x^{1/3})$

87. $(4x^{4/3})(3x^{2/3})$

88. $(4a^{-1/2}b^{1/3})(2a^{-3/2}b^{-4/3})$

89. $(3a^{-1/4}b^{1/5})(5a^{5/4}b^{-6/5})$

90. $(5a^{1/4}b^{1/3}) \cdot (2a^{-3/4}b^{1/6})$

91. $(3a^{-1/4}b^{2/5})(2a^{1/2}b^{-1/15})$

92. $(36x^6y^4)^{1/2}$

93. $(49x^{10}y^4)^{1/2}$

94. $(2x^{-1/5}y^{1/5})^5$

95. $(3x^{-3/4}y^{1/4})^4$

96. $(81x^4y^{-8})^{3/4}$

97. $(2x^{-3/5}y^{2/15})^5$

98. $\dfrac{3x^{-2}y^3}{(9y^4x^{-1/2})^{1/2}}$

99. $\dfrac{4x^{-3}y^2}{(81x^6y^4)^{1/2}}$

100. $\dfrac{9x^{-4}y^5}{(81x^6y^{-8})^{1/2}}$

101. $\dfrac{(100x^{-10}y^8)^{1/2}}{2x^5y^4}$

102. $\dfrac{(-27x^9y^{12})^{1/3}}{-3x^5y^2}$

103. $\dfrac{(-32x^{15}y^{20})^{1/5}}{x^{-3}y^{-4}}$

104. $\dfrac{(49x^{12}y^{11})^{1/2}}{-x^{-2}y^{3/2}}$

105. $\left(\dfrac{2x^{1/6}}{x^{5/6}}\right)^{-6}$

106. $\left(\dfrac{4^{-1}x^{-4}}{9x^2}\right)^{-1/2}$

107. $\left(\dfrac{8x^{-6}}{27^{-1}x^{12}}\right)^{-1/3}$

108. $\left(\dfrac{32^{-1}x^{10}}{x^{-15}}\right)^{1/5}$

109. $\left(\dfrac{125x^{-3}}{x^{-12}}\right)^{-1/3}$

110. $\left(\dfrac{5x^{-1/3}}{x^{-4/3}}\right)^{3}$

Simplify the given expressions.

111. $(8x^2 - 4x + 2) - (-5x^2 + 3x - 7)$

112. $(6x^2 - 3x + 3) + (-5x^2 - 5)$

113. $(-9x^2 - 7x + 5) - (4x^3 + 2x)$

114. $(-7x^2 - 5x + 3) + (5x^2 - 10)$

115. $(4x^3 - 3x) - (-2x^2 + x - 1)$

116. $(8x^3 - 2x^2 + 1) - (4x^2 - 3x)$

117. $(-10x^4 + 3x^2 + 2) - (-3x^3 + 2x^2 + 4x)$

118. $(4x^3 + 2x^2 - 3x + 2) - (x^3 - x - 8)$

119. $(8x^3 - 3x^2 + 4) - (-x^2 + 2x + 1)$

120. $(-12x^3 + 2x - 3) - (4x^2 - 3x - 5)$

Find the product.

121. $(4n - 7)(3n + 2)$

122. $(3y + 2)(3y - 2)$

123. $(2x + 3)(x^2 - 5x + 7)$

124. $(2x - 3y)(3x - 2y)$

125. $(4x - 3)(2x^2 - 3x - 1)$

126. $(3x + 4y)^2$

127. $(3x + 2)(x^2 + 2x + 4)$

128. $(3y^2 + 2y - 1)(y^3 + 2)$

129. $(1 + x + x^2)(1 - x + x^2)$

130. $(1 - x - x^2)(1 - x + x^2)$

131. $(a + 2)^3$

132. $(b - 3)^3$

133. $(3x + 2)^3$

134. $(2x - 1)^3$

135. $(x + 2y)^3$

Factor Completely.

136. $x^2 - 16$

137. $4x^2 - 25$

138. $16m^4 - 25n^4$

139. $x^2 - 7x + 12$

140. $x^2 + 4x - 12$

141. $2x^2 - 7x - 15$

142. $3x^2 - x - 2$

143. $10x^2 - 33x - 7$

144. $4x^2 - 12x + 9$

145. $12x^2 + 5x - 2$

146. $9x^2 + 30x + 25$

147. $3x^2 + 12x - 36$

148. $5x^2 - 7x - 6$

149. $9x^2 - 12x + 4$

150. $16x^2 - 40x + 25$

151. $4x^2 + 28x + 49$

152. $2x^2 + 2x - 24$

153. $5x^2 + 5x - 10$

154. $3t^2 - 3t - 18$

155. $10z^2 - 50z - 240$

156. $3x^3 - x^2 - 2x$

157. $2x^3 - x^2 - x$

158. $12x^3 + 7x^2 + x$

159. $3x^3 - 5x^2 + 2x$

160. $x^3 - 5x^2 + 6x$

161. $9x^2 - 6x^3 + x^4$

162. $x^3 - 1$

163. $x^3 - 8$

164. $x^3 + 1$

165. $x^3 + 8$

166. $27x^3 + 8$

167. $8x^3 - 27$

168. $m^3 - 64n^3$

169. $x^3 - 8x^2 + 2x - 16$

170. $x^3 - 3x^2 + 7x - 21$

171. $3x^3 + x^2 + 15x + 5$

172. $2y^2 - 6y + 5y - 15$

173. $5x^2 - 40x - x + 8$

174. $2x^2 - 4x - 3x + 6$

175. $8ac + 4ad + 3bd + 6bc$

176. $x(x + 5) - 3(x + 5)$

177. $2(x + 7)^2 - 3x(x + 7)$

178. $3x(x - 2) + 5(x - 2)^2$

179. $2x(x + 1) + 7(x + 1)^2$

180. $(2y - 3)(y + 2) + (y + 5)(y + 2)$

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

182. $(x + 2)(x - 5)^2 + (x + 2)^2(x - 5)$

183. $(3x - 5)(2x - 3)^2 + (3x - 5)^2(2x - 3)$

Perform the indicated operation and simplify.

184. $\dfrac{x^2-1}{x^3-1}$

185. $\dfrac{a^3+b^3}{a^2-b^2}$

186. $\dfrac{x^3-8}{x^2+4x-12}$

187. $\dfrac{x^2+14x+48}{x^2+15x+56}$

188. $\dfrac{x^2+11x+18}{x^2+14x+45}$

189. $\dfrac{x^2-4}{x^2+10x+16}$

190. $\dfrac{2x^3-x^2-10x}{x^3-2x^2-8x}$

191. $\dfrac{2x^2+5x-3}{1-2x}$

192. $\dfrac{x^2+x-6}{9-x^2}$

193. $\dfrac{x^2+5x-14}{2-x}$

194. $\dfrac{x}{x^2+11x+28}+\dfrac{2x-3}{x+7}$

195. $\dfrac{x}{x^2-15x+56}+\dfrac{2x-3}{x-7}$

196. $\dfrac{x}{x^2+13x+36}+\dfrac{2x-3}{x+9}$

197. $\dfrac{3}{x-1}-\dfrac{x-4}{x^2-2x+1}$

198. $\dfrac{x}{x-3}-\dfrac{x+1}{x^2+5x-24}$

199. $\dfrac{t}{t^2+11t+30}-\dfrac{5}{t^2+9t+20}$

200. $\dfrac{t}{t^2+5t+6}-\dfrac{2}{t^2+3t+2}$

201. $\dfrac{6}{x+5}-\dfrac{2}{x-3}$

202. $\dfrac{4x}{x-4}+\dfrac{7}{4-x}$

203. $\dfrac{2x}{x-5}+\dfrac{5}{5-x}$

Simplify.

204. $\dfrac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{xy}}$

205. $\dfrac{1+\frac{1}{x}}{1-\frac{1}{x}}$

206. $\dfrac{\frac{1}{4}+\frac{5}{x}}{\frac{x+5}{20}}$

207. $\dfrac{\frac{1}{5}+\frac{5}{x}}{\frac{x+7}{35}}$

208. $\dfrac{\frac{1}{7}+\frac{5}{x}}{\frac{x+7}{21}}$

209. $\dfrac{\frac{1}{6}+\frac{4}{x}}{\frac{x+9}{42}}$

210. $\dfrac{\frac{1}{y+3}-\frac{1}{y}}{\frac{1}{y}}$

211. $\dfrac{\frac{5}{x}-6}{\frac{3}{x^2}+1}$

212. $\dfrac{\frac{3}{x}-2}{\frac{4}{x^2}+3}$

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

214. $\dfrac{\frac{6}{x^3}+2}{\frac{5}{x^2}+1}$

215. $\dfrac{3-\frac{2}{x}}{8-\frac{5}{x^2}}$

216. $\dfrac{5-\frac{3}{x}}{2-\frac{5}{x^2}}$

217. $\dfrac{3(x-1)^2+(x-1)^3}{(x-1)^2}$

218. $\dfrac{2(x-3)^2+(x-3)^3}{(x-3)^2}$

219. $\dfrac{5(x-8)^3+(x-8)^4}{(x-8)^3}$

220. $\dfrac{(x-2)^2-8x(x-2)^3}{(x-2)^2}$

221. $\dfrac{3(x-1)^2+17(x-1)}{(x-1)}$

222. $\dfrac{2(x+2)^3+5(x+2)^2}{(x+2)^2}$

Simplify each expression. Assume all variables are greater than 0.

223. $\sqrt{25x^3y^2}$

224. $\sqrt{8x^5y^4}$

225. $\sqrt[3]{-27}$

226. $\sqrt[3]{-8}$

227. $\sqrt[3]{8x^5}$

228. $\sqrt[3]{16x^6}$

229. $\sqrt[4]{16x^{13}}$

230. $\sqrt[4]{81x^9}$

231. $\dfrac{6+2\sqrt{3}}{4}$

232. $\dfrac{3+9\sqrt{5}}{6}$

233. $\dfrac{4+8\sqrt{2}}{4}$

234. $\dfrac{6+15\sqrt{11}}{3}$

235. $\dfrac{10+30\sqrt{5}}{10}$

236. $\dfrac{15+12\sqrt{7}}{3}$

237. $\dfrac{12+20\sqrt{13}}{8}$

238. $\dfrac{10+25\sqrt{17}}{5}$

Perform the indicated operation & simplify.

239. $(3\sqrt{8})(-2\sqrt{3})$

240. $(2\sqrt{6})(-5\sqrt{12})$

241. $(\sqrt{5}-1)(\sqrt{5}+3)$

242. $(\sqrt{3}+4)(\sqrt{3}-6)$

243. $(2\sqrt{3}+5)^2$

244. $(2\sqrt{5}-1)^2$

Rationalize the denominator.

245. $\dfrac{2}{\sqrt{7}-2}$

246. $\dfrac{3}{\sqrt{5}-1}$

247. $\dfrac{4}{\sqrt{2}+3}$

248. $\dfrac{8}{\sqrt{x}+7}$

249. $\dfrac{3}{\sqrt{x}+4}$

250. $\dfrac{5}{\sqrt{x}-2}$