section 8.4

166-a) $7\sqrt{2} - 3\sqrt{2} = \underline{4\sqrt{2}}$

166-b) $7\sqrt[3]{p} + 2\sqrt[3]{p} = \underline{9\sqrt[3]{p}}$

166-c) $5\sqrt[3]{x} - 3\sqrt[3]{x} = \underline{2\sqrt[3]{x}}$

168-a) $4\sqrt{5} + 8\sqrt{5} = \underline{12\sqrt{5}}$

168-b) $\sqrt[3]{m} - 4\sqrt[3]{m} = \underline{-3\sqrt[3]{m}}$

168-c) $\sqrt{n} + 3\sqrt{n} = \underline{4\sqrt{n}}$

170-a) $\sqrt{11b} - 5\sqrt{11b} + 3\sqrt{11b} = \underline{-\sqrt{11b}}$

170-b) $8\sqrt[4]{11cd} + 5\sqrt[4]{11cd} - 9\sqrt[4]{11cd} = \underline{4\sqrt[4]{11cd}}$

172-a) $3\sqrt{5d} + 8\sqrt{5d} - 11\sqrt{5d} = \underline{0}$

172-b) $11\sqrt[3]{2rs} - 9\sqrt[3]{2rs} + 3\sqrt[3]{2rs} = \underline{5\sqrt[3]{2rs}}$

174-a) $\sqrt{72} - \sqrt{98}$

$= \sqrt{36}\sqrt{2} - \sqrt{49}\sqrt{2}$

$= 6\sqrt{2} - 7\sqrt{2}$

$= \underline{-\sqrt{2}}$

174-b)

$\sqrt[3]{24} + \sqrt[3]{81}$

$= \sqrt[3]{8}\sqrt[3]{3} + \sqrt[3]{27}\sqrt[3]{3}$

$= 2\sqrt[3]{3} + 3\sqrt[3]{3}$

$= \underline{5\sqrt[3]{3}}$

174-c) $\frac{1}{2}\sqrt[4]{80} - \frac{2}{3}\sqrt[4]{405}$

$= \frac{1}{2}\sqrt[4]{16}\sqrt[4]{5} - \frac{2}{3}\sqrt[4]{81}\sqrt[4]{5}$

$= \frac{1}{2}\left(\sqrt[4]{(2)^4}\right)\sqrt[4]{5} - \frac{2}{3}\sqrt[4]{(3)^4}\sqrt[4]{5}$

$= \frac{1}{2}(2)\sqrt[4]{5} - \frac{2}{3}(3)\sqrt[4]{5}$

$= \sqrt[4]{5} - 2\sqrt[4]{5} = \underline{-\sqrt[4]{5}}$

176-a)

$\sqrt{45} + \sqrt{80}$

$= \sqrt{9}\sqrt{5} + \sqrt{16}\sqrt{5}$

$= 3\sqrt{5} + 4\sqrt{5}$

$= \underline{7\sqrt{5}}$

176-b)

$\sqrt[3]{81} - \sqrt[3]{192}$

$= \sqrt[3]{27}\sqrt[3]{3} - \sqrt[3]{64}\sqrt[3]{3}$

$= 3\sqrt[3]{3} - 4\sqrt[3]{3}$

$= \underline{-\sqrt[3]{3}}$

176-c)

$\frac{5}{2}\sqrt[4]{80} + \frac{7}{3}\sqrt[4]{405}$

$= \frac{5}{2}\sqrt[4]{16}\sqrt[4]{5} + \frac{7}{3}\sqrt[4]{81}\sqrt[4]{5}$

$= \frac{5}{2}(2)\sqrt[4]{5} + \frac{7}{3}(3)\sqrt[4]{5}$

$= 5\sqrt[4]{5} + 7\sqrt[4]{5} = \underline{12\sqrt[4]{5}}$

178-a) $\sqrt{48b^5} - \sqrt{75b^5}$

$= \sqrt{16b^4}\sqrt{3b} - \sqrt{25b^4}\sqrt{3b}$

$= 4b^2\sqrt{3b} - 5b^2\sqrt{3b}$

$= \underline{-b^2\sqrt{3b}}$

178-b) $8\sqrt[3]{64q^6} - 3\sqrt[3]{125q^6}$

$= 8\sqrt[3]{(2)^6q^6} - 3\sqrt[3]{(5)^3q^6}$

$= 8(2)^2q^2 - 3(5)q^2$

$= 32q^2 - 15q^2 = \underline{17q^2}$

180-a) $\sqrt{96d^9} - \sqrt{24d^9}$

$= \sqrt{16d^8}\sqrt{6d} - \sqrt{4d^8}\sqrt{6d}$

$= 4d^4\sqrt{6d} - 2d^4\sqrt{6d}$

$= \underline{2d^4\sqrt{6d}}$

180-b) $5\sqrt[4]{243s^6} + 2\sqrt[4]{3s^6}$

$= 5\sqrt[4]{81s^4}\sqrt[4]{3s^2} + 2\sqrt[4]{s^4}\sqrt[4]{3s^2}$

$= 5(3s)\sqrt[4]{3s^2} + 2(s)\sqrt[4]{3s^2}$

$= 15s\sqrt[4]{3s^2} + 2s\sqrt[4]{3s^2}$

$= \underline{17s\sqrt[4]{3s}}$

---

182) $3\sqrt{75y^2} + 8y\sqrt{48} - \sqrt{300y^2}$

$= 3\sqrt{25y^2}\sqrt{3} + 8y\sqrt{16}\sqrt{3} - \sqrt{100y^2}\sqrt{3}$

$= 3(5y)\sqrt{3} + 8y(4)\sqrt{3} - 10y\sqrt{3}$

$= 15y\sqrt{3} + 32y\sqrt{3} - 10y\sqrt{3}$

$= \underline{37y\sqrt{3}}$

184-a) $(-4\sqrt{5})(5\sqrt{10})$

$= (-4\sqrt{5})(5\sqrt{2}\sqrt{5})$

$= (-4)(5)(\sqrt{5})(\sqrt{5})(\sqrt{2})$

$= (-20)(5)\sqrt{2}$

$= \underline{-100\sqrt{2}}$

184-b) $(-2\sqrt[3]{9})(7\sqrt[3]{9})$

$= (-2\sqrt[3]{(3)^2})(7\sqrt[3]{(3)^2})$

$= (-2)(7)(\sqrt[3]{(3)^3})(\sqrt[3]{3})$

$= (-2)(7)(3)\sqrt[3]{3}$

$= \underline{-42\sqrt[3]{3}}$

186-a) $(-2\sqrt{7})(-2\sqrt{14})$

$= (-2\sqrt{7})(-2\sqrt{2}\sqrt{7})$

$= (-2)(-2)(\sqrt{7})(\sqrt{7})(\sqrt{2})$

$= (4)(7)\sqrt{2}$

$= \underline{28\sqrt{2}}$

186-b) $(-3\sqrt[4]{8})(-5\sqrt[4]{6})$

$= (-3\sqrt[4]{(2)^3})(-5\sqrt[4]{(2)(3)})$

$= (-3)(-5)(\sqrt[4]{(2)^4})(\sqrt[4]{3})$

$= (15)(2)\sqrt[4]{3}$

$= \underline{30\sqrt[4]{3}}$

188-a) $(3\sqrt{2x^3})(7\sqrt{18x^2})$

$= (3\sqrt{x^2}\sqrt{2}\sqrt{x})(7\sqrt{9x^2}\sqrt{2})$

$= (3)(7)(x)(3x)(\sqrt{2})(\sqrt{2})(\sqrt{x})$

$= 63x^2(2)\sqrt{x} = \underline{126x^2\sqrt{x}}$

188-b) $(-6\sqrt[3]{20a^2})(-2\sqrt[3]{16a^3})$

$= (-6\sqrt[3]{(2)^2}\sqrt[3]{(5)}\sqrt[3]{a^2})(-2\sqrt[3]{(2)^4}\sqrt[3]{a^3})$

$= (-6)(-2)(\sqrt[3]{(2)^6})(\sqrt[3]{a^3})(\sqrt[3]{5})(\sqrt[3]{a^2})$

$= 12(2)^2(a)\sqrt[3]{5a^2}$

$= \underline{48a\sqrt[3]{5a^2}}$

190-a) $(4\sqrt{2k^5})(-3\sqrt{32k^6})$

$= (4\sqrt{k^4}\sqrt{2}\sqrt{k})(-3\sqrt{16k^6}\sqrt{2})$

$= (4)(-3)(k^2)(4k^3)(\sqrt{2})(\sqrt{2})(\sqrt{k})$

$= (-48)k^5(2)\sqrt{k}$

$= \underline{-96k^5\sqrt{k}}$

190-b) $(-\sqrt[4]{6b^3})(3\sqrt[4]{8b^3})$

$= (-(\sqrt[4]{2})(\sqrt[4]{3})(\sqrt[4]{b^3}))(3(\sqrt[4]{(2)^3})(\sqrt[4]{b^3}))$

$= -3(\sqrt[4]{(2)^4})(\sqrt[4]{b^4})(\sqrt[4]{3})(\sqrt[4]{b^2})$

$= -3(2)(b)\sqrt[4]{3b^2}$

$= \underline{-6b\sqrt[4]{3b^2}}$

192-a) $\sqrt{11}\left(8+4\sqrt{11}\right) = 8\sqrt{11} + 4(\sqrt{11})(\sqrt{11}) = 8\sqrt{11} + 4(11)$

$= \underline{8\sqrt{11} + 44 = 44 + 8\sqrt{11}}$

192-b) $\sqrt[3]{3}\left(\sqrt[3]{9} + \sqrt[3]{18}\right) = \sqrt[3]{3}\left(\sqrt[3]{(3)^2} + \left(\sqrt[3]{(2)}\right)\left(\sqrt[3]{(3)^2}\right)\right)$

$= \left(\sqrt[3]{3}\right)\left(\sqrt[3]{(3)^2}\right) + \left(\sqrt[3]{3}\right)\left(\sqrt[3]{(3)^2}\right)\left(\sqrt[3]{2}\right) = \underline{3 + 3\sqrt[3]{2}}$

194-a) $\sqrt{2}\left(-5+9\sqrt{2}\right) = -5\sqrt{2} + 9\sqrt{2}(\sqrt{2}) = -5\sqrt{2} + 9(2)$

$= \underline{-5\sqrt{2} + 18 = 18 - 5\sqrt{2}}$

194-b) $\sqrt[4]{2}\left(\sqrt[4]{12} + \sqrt[4]{24}\right) = \sqrt[4]{2}\left(\left(\sqrt[4]{(2)^2}\right)\left(\sqrt[4]{3}\right) + \left(\sqrt[4]{(2)^3}\right)\left(\sqrt[4]{3}\right)\right)$

$= \left(\sqrt[4]{(2)^3}\right)\left(\sqrt[4]{(3)}\right) + \left(\sqrt[4]{(2)}\right)\left(\sqrt[4]{(2)^3}\right)\left(\sqrt[4]{(3)}\right) = \underline{\sqrt[4]{24} + 2\sqrt[4]{3}}$

---

196) $(8-\sqrt{2})(3+\sqrt{2}) = +24 + 8\sqrt{2} - 3\sqrt{2} - 2 = \underline{22 + 5\sqrt{2}}$

198-a) $(3-2\sqrt{7})(5-4\sqrt{7}) = +15 - 12\sqrt{7} - 10\sqrt{7} + (-2\sqrt{7})(-4\sqrt{7})$

$= 15 - 22\sqrt{7} + (8)(7) = 15 - 22\sqrt{7} + 56$

$= \underline{71 - 22\sqrt{7}}$

198-b) $(\sqrt[3]{x} - 5)(\sqrt[3]{x} - 3) = +(\sqrt[3]{x})(\sqrt[3]{x}) - 3\sqrt[3]{x} - 5(\sqrt[3]{x}) + 15$

$= (\sqrt[3]{x})^2 - 8\sqrt[3]{x} + 15 = \underline{\sqrt[3]{x^2} - 8\sqrt[3]{x} + 15}$

200-a) $(7-2\sqrt{5})(4+9\sqrt{5}) = 28 + 63\sqrt{5} - 8\sqrt{5} - 18(\sqrt{5})(\sqrt{5})$

$= 28 + 55\sqrt{5} - (18)(5)$

$= 28 + 55\sqrt{5} - 90$

$= -62 + 55\sqrt{5} = 55\sqrt{5} - 62$

200-b) $(3\sqrt[3]{x} + 2)(\sqrt[3]{x} - 2) = +3(\sqrt[3]{x})(\sqrt[3]{x}) - 6\sqrt[3]{x} + 2\sqrt[3]{x} - 4$

$= 3(\sqrt[3]{x})^2 - 4\sqrt[3]{x} - 4 = 3\sqrt[3]{x^2} - 4\sqrt[3]{x} - 4$

---

202) $(\sqrt{11} + \sqrt{5})(\sqrt{11} + 6\sqrt{5}) = 11 + 6(\sqrt{5})(\sqrt{11}) + (\sqrt{5})(\sqrt{11}) + 6(5)$

$= 11 + 6\sqrt{55} + \sqrt{55} + 30 = 41 + 7\sqrt{55}$

---

204) $(4\sqrt{6} + 7\sqrt{13})(8\sqrt{6} - 3\sqrt{13}) = 32(6) - 12(\sqrt{6})(\sqrt{13}) + 56(\sqrt{13})(\sqrt{6}) - 21(13)$

$= 192 - 12\sqrt{78} + 56\sqrt{78} - 273$

$= 44\sqrt{78} - 81 = -81 + 4\sqrt{78}$

206-a) $(4+\sqrt{11})^2 = (4+\sqrt{11})(4+\sqrt{11}) = 16 + 4\sqrt{11} + 4\sqrt{11} + 11$

$= 27 + 8\sqrt{11}$

206-b) $(3-2\sqrt{5})^2 = (3-2\sqrt{5})(3-2\sqrt{5}) = 9 - 6\sqrt{5} - 6\sqrt{5} + 4(5)$

$= 9 - 12\sqrt{5} + 20$

$= 29 - 12\sqrt{5}$

208-a) $(5-\sqrt{10})^2 = (5-\sqrt{10})(5-\sqrt{10}) = 25 - 5\sqrt{10} - 5\sqrt{10} + 10$

$= \underline{35 - 10\sqrt{10}}$

208-b) $(8+3\sqrt{2})^2 = (8+3\sqrt{2})(8+3\sqrt{2}) = 64 + 24\sqrt{2} + 24\sqrt{2} + 9(2)$

$= 64 + 48\sqrt{2} + 18 = \underline{82 + 48\sqrt{2}}$

---

210) $(7+\sqrt{10})(7-\sqrt{10}) = 49 - 7\sqrt{10} + 7\sqrt{10} - 10 = \underline{39}$

---

212) $(1+8\sqrt{2})(1-8\sqrt{2}) = 1 - 8\sqrt{2} + 8\sqrt{2} - 64(2) = 1 - 128 = \underline{-127}$

---

214) $(9-4\sqrt{3})(9+4\sqrt{3}) = 81 + 36\sqrt{3} - 36\sqrt{3} - 16(3) = 81 - 48 = \underline{33}$

---

216) $(\sqrt[3]{4x}+3)(\sqrt[3]{4x}-3) = (\sqrt[3]{4x})(\sqrt[3]{4x}) - 3\sqrt[3]{4x} + 3\sqrt[3]{4x} - 9$

$= \underline{(\sqrt[3]{4x})^2 - 9 = \sqrt[3]{(4x)^2} - 9}$

---

218) $\sqrt{175k^4} - \sqrt{63k^4}$

$= \sqrt{25k^4}\sqrt{7} - \sqrt{9k^4}\sqrt{7}$

$= 5k^2\sqrt{7} - 3k^2\sqrt{7}$

$= \underline{2k^2\sqrt{7}}$

220) $\sqrt[3]{24} + \sqrt[3]{81}$

$= \sqrt[3]{(2)^3}\sqrt[3]{3} + \sqrt[3]{(3)^3}\sqrt[3]{3}$

$= 2\sqrt[3]{3} + 3\sqrt[3]{3}$

$= \underline{5\sqrt[3]{3}}$

222) $8\sqrt[4]{13} - 4\sqrt[4]{13} - 3\sqrt[4]{13} = \sqrt[4]{13}$

226) $21\sqrt[3]{9} - 2\sqrt[3]{9} = 19\sqrt[3]{9}$

228) $11\sqrt{11} - 10\sqrt{11} = \sqrt{11}$

230) $(4\sqrt{6})(-\sqrt{18}) = (4(\sqrt{(2)(3)}))(-\sqrt{9}\sqrt{2})$

$= (4(\sqrt{2})(\sqrt{3})(-3(\sqrt{2}))$

$= (4)(-3)(\sqrt{2})(\sqrt{2})(\sqrt{3}) = -12(2)\sqrt{3} = -24\sqrt{3}$

232) $(4\sqrt{12x^5})(2\sqrt{6x^3}) = (4\sqrt{4x^4}\sqrt{3x})(2\sqrt{x^2}\sqrt{(2)(3)(x)})$

$= (4(2x^2)(\sqrt{3})(\sqrt{2x}))(2(x)(\sqrt{2})(\sqrt{3})(\sqrt{2x}))$

$= (4)(2)(2x^2)(x)(\sqrt{3})(\sqrt{3})(\sqrt{2x})(\sqrt{2x})(\sqrt{2})$

$= 16x^3(3)(x)\sqrt{2} = 48x^4\sqrt{2}$

234) $(-4\sqrt{17})(-3\sqrt{17}) = 12(17) = 204$

236) $(3\sqrt[4]{8a^2})(\sqrt[4]{12a^3}) = (3(\sqrt[4]{(2)^3})(\sqrt[4]{a^2}))(\sqrt[4]{(2)^2})(\sqrt[4]{3})(\sqrt[4]{a^3})$

$= 3(\sqrt[4]{(2)^4})(\sqrt[4]{a^4})(\sqrt[4]{2})(\sqrt[4]{3})(\sqrt[4]{a})$

$= 3(2)(a)\sqrt[4]{(2)(3)(a)}$

$= 6a\sqrt[4]{6a}$

238) $\sqrt{3}\left(4-3\sqrt{3}\right) = 4\sqrt{3} - 3(\sqrt{3})(\sqrt{3}) = 4\sqrt{3} - 3(3)$

$= 4\sqrt{3} - 9 \quad = -9 + 4\sqrt{3}$

---

240) $(\sqrt{6}+\sqrt{3})(\sqrt{6}+6\sqrt{3}) = +6 + 6(\sqrt{3})(\sqrt{6}) + (\sqrt{3})(\sqrt{6}) + 6(3)$

$= 6 + 6\sqrt{18} + \sqrt{18} + 18$

$= 24 + 7\sqrt{18}$