

$$137. \sqrt{-3}\sqrt{-3} = \sqrt{(-3)(-3)} = \sqrt{9} = 3$$

The product rule for radicals does not hold if both radicands are negative.

$$\sqrt{-3}\sqrt{-3} = i\sqrt{3} \cdot i\sqrt{3} = i^2(3) = -3$$

$$139. 3 - 2i, \text{ conjugate} = 3 + 2i$$

$$\begin{aligned} \text{product} &= (3 - 2i)(3 + 2i) \\ &= 3^2 - (2i)^2 \\ &= 9 + 4 \\ &= 13 \end{aligned}$$

Review Exercises for Chapter 5

$$1. \sqrt{49} = 7 \text{ because } 7 \cdot 7 = 49$$

$$3. -\sqrt{81} = -9 \text{ because } 9 \cdot 9 = 81$$

$$5. \sqrt[3]{-8} = -2 \text{ because } -2 \cdot -2 \cdot -2 = -8$$

$$7. -\sqrt[3]{64} = -4 \text{ because } 4 \cdot 4 \cdot 4 = 64$$

$$9. \sqrt{(1.2)^2} = 1.2 \text{ (inverse property of powers and roots)}$$

$$11. \sqrt{\left(\frac{5}{6}\right)^2} = \frac{5}{6} \text{ (inverse property of powers and roots)}$$

$$13. \sqrt[3]{-\left(\frac{1}{5}\right)^3} = -\frac{1}{5} \text{ (inverse property of powers and roots)}$$

$$15. \sqrt{-2^2} = 2i$$

$$17. 49^{1/2} = 7$$

$$19. \sqrt[3]{216} = 6$$

$$21. 27^{4/3} = (\sqrt[3]{27})^4 = 3^4 = 81$$

$$23. -(5^2)^{3/2} = -(\sqrt{25})^3 = -5^3 = -125$$

$$25. 8^{-4/3} = \frac{1}{8^{4/3}} = \frac{1}{(\sqrt[3]{8})^4} = \frac{1}{2^4} = \frac{1}{16}$$

$$\begin{aligned} 27. -\left(\frac{27}{64}\right)^{2/3} &= -\left(\sqrt[3]{\frac{27}{64}}\right)^2 \\ &= -\left(\frac{3}{4}\right)^2 \\ &= -\frac{9}{16} \end{aligned}$$

$$\begin{aligned} 29. x^{3/4} \cdot x^{-1/6} &= x^{3/4 + (-1/6)} \\ &= x^{9/12 + (-2)/12} \\ &= x^{7/12} \end{aligned}$$

$$\begin{aligned} 31. z\sqrt[3]{z^2} &= z \cdot z^{2/3} \\ &= z^{1+2/3} \\ &= z^{5/3} \end{aligned}$$

$$33. \frac{\sqrt[4]{x^3}}{\sqrt{x^4}} = \frac{x^{3/4}}{x^{4/2}} = x^{3/4-2} = x^{3/4-8/4} = x^{-5/4} = \frac{1}{x^{5/4}}$$

$$35. \sqrt[3]{a^3b^2} = a\sqrt[3]{b^2}$$

$$37. \sqrt[4]{\sqrt{x}} = \sqrt[4]{x^{1/2}} = (x^{1/2})^{1/4} = x^{1/8} = \sqrt[8]{x}$$

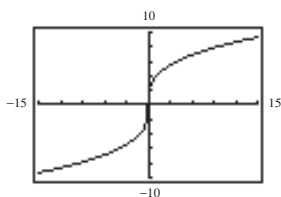
$$\begin{aligned} 39. \frac{(3x+2)^{2/3}}{\sqrt[3]{3x+2}} &= \frac{(3x+2)^{2/3}}{(3x+2)^{1/3}} \\ &= (3x+2)^{2/3-1/3} \\ &= (3x+2)^{1/3} \\ &= \sqrt[3]{3x+2} \end{aligned}$$

$$41. 75^{-3/4} = 0.0392377 \approx 0.04$$

$$43. \sqrt{13^2 - 4(2)(7)} = 10.630146 \approx 10.63$$

45. Keystrokes:

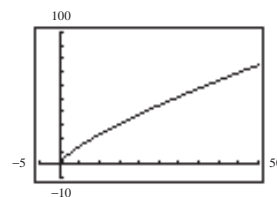
$\boxed{Y=}$ $\boxed{3}$ $\boxed{\sqrt[3]{}}$ $\boxed{2}$ $\boxed{X,T,\theta}$ $\boxed{\text{GRAPH}}$



Domain = $(-\infty, \infty)$

47. Keystrokes:

$\boxed{Y=}$ $\boxed{4}$ $\boxed{X,T,\theta}$ $\boxed{\wedge}$ $\boxed{.75}$ $\boxed{\text{GRAPH}}$



Domain = $[0, \infty)$

$$49. \sqrt{360} = \sqrt{36 \cdot 10} \\ = 6\sqrt{10}$$

$$51. \sqrt{75u^5v^4} = \sqrt{25 \cdot 3 \cdot u^4 \cdot u \cdot v^4} \\ = 5u^2v^2\sqrt{3u}$$

$$53. \sqrt{0.25x^4y} = \sqrt{25 \times 10^{-2}x^4y} \\ = 5 \times 10^{-1}x^2\sqrt{y} \\ = 0.5x^2\sqrt{y}$$

$$55. \sqrt[4]{64a^2b^5} = \sqrt[4]{16 \cdot 4 \cdot a^2 \cdot b^4 \cdot b} \\ = 2b\sqrt[4]{4a^2b}$$

$$57. \sqrt[3]{48a^3b^4} = \sqrt[3]{8 \cdot 6a^3b^3b} \\ = 2ab\sqrt[3]{6b}$$

$$59. \sqrt{\frac{5}{6}} = \sqrt{\frac{5}{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{30}}{6}$$

$$61. \frac{3}{\sqrt{12x}} = \frac{3}{\sqrt{4 \cdot 3x}} = \frac{3}{2\sqrt{3x}} \cdot \frac{\sqrt{3x}}{\sqrt{3x}} = \frac{3\sqrt{3x}}{6x} = \frac{\sqrt{3x}}{2x}$$

$$63. \frac{2}{\sqrt[3]{2x}} = \frac{2}{\sqrt[3]{2x}} \cdot \frac{\sqrt[3]{2^2x^2}}{\sqrt[3]{2^2x^2}} = \frac{2\sqrt[3]{4x^2}}{\sqrt[3]{8x^3}} = \frac{2\sqrt[3]{4x^2}}{2x} = \frac{\sqrt[3]{4x^2}}{x}$$

$$65. 2\sqrt{7} - 5\sqrt{7} + 4\sqrt{7} = \sqrt{7}(2 - 5 + 4) \\ = \sqrt{7}$$

$$67. 3\sqrt{40} - 10\sqrt{90} = 3\sqrt{4 \cdot 10} - 10\sqrt{9 \cdot 10} \\ = 6\sqrt{10} - 30\sqrt{10} \\ = -24\sqrt{10}$$

$$69. 5\sqrt{x} - \sqrt[3]{x} + 9\sqrt{x} - 8\sqrt[3]{x} = 5\sqrt{x} + 9\sqrt{x} - \sqrt[3]{x} - 8\sqrt[3]{x} \\ = (5 + 9)\sqrt{x} + (-1 - 8)\sqrt[3]{x} \\ = 14\sqrt{x} - 9\sqrt[3]{x}$$

$$71. 10\sqrt[4]{y+3} - 3\sqrt[4]{y+3} = (10 - 3)\sqrt[4]{y+3} \\ = 7\sqrt[4]{y+3}$$

$$73. \sqrt{25x} + \sqrt{49x} - \sqrt[3]{8x} = 5\sqrt{x} + 7\sqrt{x} - 2\sqrt[3]{x} \\ = 12\sqrt{x} - 2\sqrt[3]{x}$$

$$75. \sqrt{5} - \frac{3}{\sqrt{5}} = \sqrt{5} - \frac{3}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} \\ = \sqrt{5} - \frac{3\sqrt{5}}{5} \\ = \sqrt{5} \cdot \frac{5}{5} - \frac{3\sqrt{5}}{5} \\ = \frac{5\sqrt{5}}{5} - \frac{3\sqrt{5}}{5} \\ = \frac{2\sqrt{5}}{5}$$

$$77. \sqrt{15} \cdot \sqrt{20} = \sqrt{15 \cdot 20} \\ = \sqrt{300} \\ = \sqrt{100 \cdot 3} \\ = 10\sqrt{3}$$

$$79. \sqrt{5}(\sqrt{10} + 3) = \sqrt{5}\sqrt{10} + \sqrt{5} \cdot 3 \\ = \sqrt{50} + 3\sqrt{5} \\ = \sqrt{25 \cdot 2} + 3\sqrt{5} \\ = 5\sqrt{2} + 3\sqrt{5}$$

$$81. \sqrt{10}(\sqrt{2} + \sqrt{5}) = \sqrt{10}\sqrt{2} + \sqrt{10}\sqrt{5} \\ = \sqrt{20} + \sqrt{50} \\ = \sqrt{4 \cdot 5} + \sqrt{25 \cdot 2} \\ = 2\sqrt{5} + 5\sqrt{2}$$

$$83. (2\sqrt{3} + 7)(\sqrt{6} - 2) = 2\sqrt{3}\sqrt{6} - 4\sqrt{3} + 7\sqrt{6} - 14 \\ = 2\sqrt{18} - 4\sqrt{3} + 7\sqrt{6} - 14 \\ = 6\sqrt{2} - 4\sqrt{3} + 7\sqrt{6} - 14$$

$$85. (\sqrt{5} + 6)^2 = (\sqrt{5})^2 + 2(6)\sqrt{5} + 6^2 = 5 + 12\sqrt{5} + 36 = 41 + 12\sqrt{5}$$

$$87. (\sqrt{3} - \sqrt{x})(\sqrt{3} + \sqrt{x}) = 3 - \sqrt{3x} + \sqrt{3x} - x = 3 - x$$

$$\begin{aligned}
 89. \quad \frac{3}{1-\sqrt{2}} \cdot \frac{1+\sqrt{2}}{1+\sqrt{2}} &= \frac{3(1+\sqrt{2})}{1^2 - (\sqrt{2})^2} \\
 &= \frac{3(1+\sqrt{2})}{1-2} \\
 &= \frac{3(1+\sqrt{2})}{-1} \\
 &= -3(1+\sqrt{2})
 \end{aligned}$$

$$\begin{aligned}
 91. \quad \frac{3\sqrt{8}}{2\sqrt{2}+\sqrt{3}} \cdot \frac{2\sqrt{2}-\sqrt{3}}{2\sqrt{2}-\sqrt{3}} &= \frac{6\sqrt{16}-3\sqrt{24}}{(2\sqrt{2})^2 - (\sqrt{3})^2} \\
 &= \frac{24-6\sqrt{6}}{8-3} \\
 &= \frac{24-6\sqrt{6}}{5}
 \end{aligned}$$

$$\begin{aligned}
 93. \quad \frac{\sqrt{2}-1}{\sqrt{3}-4} &= \frac{\sqrt{2}-1}{\sqrt{3}-4} \cdot \frac{\sqrt{3}+4}{\sqrt{3}+4} \\
 &= \frac{\sqrt{6}+4\sqrt{2}-\sqrt{3}-4}{(\sqrt{3})^2-4^2} \\
 &= \frac{\sqrt{6}+4\sqrt{2}-\sqrt{3}-4}{3-16} \\
 &= \frac{\sqrt{6}+4\sqrt{2}-\sqrt{3}-4}{-13} \\
 &= -\frac{\sqrt{6}+4\sqrt{2}-\sqrt{3}-4}{13}
 \end{aligned}$$

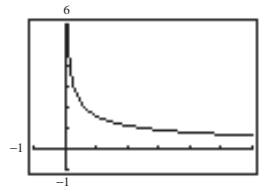
$$\begin{aligned}
 95. \quad \frac{\sqrt{x}+10}{\sqrt{x}-10} &= \frac{\sqrt{x}+10}{\sqrt{x}-10} \cdot \frac{\sqrt{x}+10}{\sqrt{x}+10} \\
 &= \frac{x+10\sqrt{x}+10\sqrt{x}+100}{(\sqrt{x})^2-10^2} \\
 &= \frac{x+20\sqrt{x}+100}{x-100}
 \end{aligned}$$

97. Keystrokes:

$$y_1 \text{ [Y=] [✓] [C] 5 [÷] [C] 2 [X,T,θ] [)] [)] [ENTER]$$

$$y_2 \text{ [✓] [C] 10 [X,T,θ] [)] [÷] [C] 2 [X,T,θ] [)] [GRAPH]$$

$$\sqrt{\frac{5}{2x}} = \sqrt{\frac{5}{2x}} \cdot \frac{\sqrt{2x}}{\sqrt{2x}} = \frac{\sqrt{10x}}{2x}$$

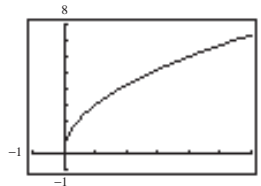


99. Keystrokes:

$$y_1 \text{ [Y=] 5 [✓] [X,T,θ] [-] 2 [✓] [X,T,θ] [)] [ENTER]$$

$$y_2 \text{ 3 [✓] [X,T,θ] [)] [GRAPH]$$

$$5\sqrt{x} - 2\sqrt{x} = (5-2)\sqrt{x} = 3\sqrt{x}$$



$$\begin{aligned}
 101. \quad \sqrt{y} &= 15 & \text{Check: } \sqrt{225} &\stackrel{?}{=} 15 \\
 (\sqrt{y})^2 &= (15)^2 & 15 &= 15 \\
 y &= 225
 \end{aligned}$$

$$\begin{aligned}
 103. \quad \sqrt{3x} + 9 &= 0 & \text{Check: } \sqrt{3 \cdot 27} + 9 &\stackrel{?}{=} 0 \\
 \sqrt{3} &= -9 & \sqrt{81} + 9 &\stackrel{?}{=} 0 \\
 (\sqrt{3x})^2 &= (-9)^2 & 9 + 9 &\stackrel{?}{=} 0 \\
 3x &= 81 & 18 &\neq 0 \\
 x &= \frac{81}{3} & \text{No real solution} \\
 x &= 27
 \end{aligned}$$

$$\begin{aligned}
 105. \quad \sqrt{2(a-7)} &= 14 & \text{Check: } \sqrt{2(105-7)} &\stackrel{?}{=} 14 \\
 (\sqrt{2(a-7)})^2 &= (14)^2 & \sqrt{196} &\stackrel{?}{=} 14 \\
 2(a-7) &= 196 & 14 &= 14 \\
 2a-14 &= 196 \\
 2a &= 210 \\
 a &= 105
 \end{aligned}$$

$$\begin{aligned}
 107. \quad \sqrt[3]{5x-7} - 3 &= -1 & \text{Check: } \sqrt[3]{5(3)-7} - 3 &\stackrel{?}{=} -1 \\
 \sqrt[3]{5x-7} &= 2 & \sqrt[3]{8} - 3 &\stackrel{?}{=} -1 \\
 (\sqrt[3]{5x-7})^3 &= 2^3 & 2 - 3 &\stackrel{?}{=} -1 \\
 5x-7 &= 8 & -1 &= -1 \\
 5x &= 15 \\
 x &= 3
 \end{aligned}$$

$$109. \sqrt[3]{5x+2} - \sqrt[3]{7x-8} = 0$$

$$\begin{aligned}\sqrt[3]{5x+2} &= \sqrt[3]{7x-8} \\ (\sqrt[3]{5x+2})^3 &= (\sqrt[3]{7x-8})^3 \\ 5x+2 &= 7x-8 \\ 10 &= 2x \\ 5 &= x\end{aligned}$$

$$\begin{aligned}\text{Check: } \sqrt[3]{5(5)+2} - \sqrt[3]{7(5)-8} &\stackrel{?}{=} 0 \\ \sqrt[3]{27} - \sqrt[3]{27} &\stackrel{?}{=} 0 \\ 0 &= 0\end{aligned}$$

$$111. \sqrt{2(x+5)} = x+5$$

$$\begin{aligned}(\sqrt{2(x+5)})^2 &= (x+5)^2 \\ 2(x+5) &= x^2 + 10x + 25 \\ 2x+10 &= x^2 + 10x + 25 \\ 0 &= x^2 + 8x + 15 \\ 0 &= (x+5)(x+3) \\ -5 = x, \quad x &= -3\end{aligned}$$

$$\begin{aligned}\text{Check: } \sqrt{2(-5+5)} &\stackrel{?}{=} -5+5 \\ \sqrt{0} &\stackrel{?}{=} 0 \\ 0 &= 0 \\ \sqrt{2(-3+5)} &\stackrel{?}{=} -3+5 \\ \sqrt{4} &\stackrel{?}{=} 2 \\ 2 &= 2\end{aligned}$$

$$113. \sqrt{v-6} = 6-v$$

$$\begin{aligned}(\sqrt{v-6})^2 &= (6-v)^2 \\ v-6 &= 36 - 12v + v^2 \\ 0 &= v^2 - 13v + 42 \\ 0 &= (v-6)(v-7) \\ v &= 6, \quad v = 7\end{aligned}$$

$$\begin{aligned}\text{Check: } \sqrt{6-6} &\stackrel{?}{=} 6-6 \\ 0 &= 0 \\ \sqrt{7-6} &\stackrel{?}{=} 6-7 \\ 1 &\neq -1 \\ \text{not a solution}\end{aligned}$$

$$115. \sqrt{1+6x} = 2 - \sqrt{6x}$$

$$\begin{aligned}(\sqrt{1+6x})^2 &= (2 - \sqrt{6x})^2 \\ 1+6x &= 4 - 4\sqrt{6x} + 6x \\ 1 &= 4 - 4\sqrt{6x} \\ -3 &= -4\sqrt{6x} \\ (3)^2 &= (4\sqrt{6x})^2 \\ 9 &= 16(6x) \\ \frac{9}{96} &= x \\ \frac{3}{32} &= x\end{aligned}$$

$$\begin{aligned}\text{Check: } \sqrt{1+6\left(\frac{3}{32}\right)} &\stackrel{?}{=} 2 - \sqrt{6\left(\frac{3}{32}\right)} \\ \sqrt{\frac{32}{32} + \frac{18}{32}} &\stackrel{?}{=} 2 - \sqrt{\frac{18}{32}} \\ \sqrt{\frac{50}{32}} &\stackrel{?}{=} 2 - \sqrt{\frac{9 \cdot 2}{16 \cdot 2}} \\ \sqrt{\frac{25 \cdot 2}{16 \cdot 2}} &\stackrel{?}{=} 2 - \sqrt{\frac{9 \cdot 2}{16 \cdot 2}} \\ \sqrt{\frac{25}{16}} &\stackrel{?}{=} 2 - \sqrt{\frac{9}{16}} \\ \frac{5}{4} &\stackrel{?}{=} 2 - \frac{3}{4} \\ \frac{5}{4} &\stackrel{?}{=} \frac{8}{4} - \frac{3}{4} \\ \frac{5}{4} &= \frac{5}{4}\end{aligned}$$

$$117. \sqrt{-48} = \sqrt{16 \cdot 3 \cdot -1} = 4i\sqrt{3}$$

$$\begin{aligned}119. 10 - 3\sqrt{-27} &= 10 - 3\sqrt{-1 \cdot 9 \cdot 3} \\ &= 10 - 3\sqrt{-1} \cdot \sqrt{9} \cdot \sqrt{3} \\ &= 10 - 9i\sqrt{3}\end{aligned}$$

$$\begin{aligned}
 121. \quad \frac{3}{4} - 5\sqrt{-\frac{3}{25}} &= \frac{3}{4} - 5\sqrt{\frac{3}{25}} \cdot -1 \\
 &= \frac{3}{4} - \frac{5}{3}i\sqrt{3} \\
 &= \frac{3}{4} - i\sqrt{3}
 \end{aligned}$$

$$125. \quad \sqrt{-121} - \sqrt{-84} = 11i - 2i\sqrt{21}$$

$$\begin{aligned}
 129. \quad \sqrt{-10}(\sqrt{-4} - \sqrt{-7}) &= i\sqrt{10}(2i - i\sqrt{7}) \\
 &= 2i^2\sqrt{10} - i^2\sqrt{70} \\
 &= -2\sqrt{10} + \sqrt{70}
 \end{aligned}$$

$$\begin{aligned}
 133. \quad 24 + \sqrt{-5y} &= 6x + 25i \\
 24 + i\sqrt{5y} &= 6x + 25i \\
 24 &= 6x \quad \sqrt{5y} = 25 \\
 4 &= x \quad 5y = 625 \\
 & \quad y = 125
 \end{aligned}$$

$$\begin{aligned}
 137. \quad (3 - 8i) + (5 + 12i) &= 3 - 8i + 5 + 12i \\
 &= (3 + 5) + (-8 + 12)i \\
 &= 8 + 4i
 \end{aligned}$$

$$\begin{aligned}
 141. \quad (6 - 5i)^2 &= 6^2 - 2(6)(5i) + (5i)^2 \\
 &= 36 - 60i - 25 \\
 &= 11 - 60i
 \end{aligned}$$

$$\begin{aligned}
 145. \quad \frac{4i}{2 - 8i} &= \frac{4i}{2 - 8i} \cdot \frac{2 + 8i}{2 + 8i} \\
 &= \frac{8i + 32i^2}{2^2 - (8i)^2} \\
 &= \frac{8i - 32}{4 + 64} \\
 &= \frac{8i - 32}{68} \\
 &= \frac{-8 + 2i}{17} \\
 &= \frac{-8}{17} + \frac{2}{17}i
 \end{aligned}$$

$$\begin{aligned}
 123. \quad \sqrt{-81} + \sqrt{-36} &= 9i + 6i \\
 &= 15i
 \end{aligned}$$

$$127. \quad \sqrt{-5}\sqrt{-5} = i\sqrt{5} \cdot i\sqrt{5} = i^2 \cdot 5 = -5$$

$$\begin{aligned}
 131. \quad 4x - \sqrt{-36} &= 8 - 2yi \\
 4x - 6i &= 8 - 2yi \\
 4x &= 8 \quad -6 = -2y \\
 x &= 2 \quad 3 = y
 \end{aligned}$$

$$135. \quad (-4 + 5i) - (-12 + 8i) = (-4 + 12) + (5 - 8)i = 8 - 3i$$

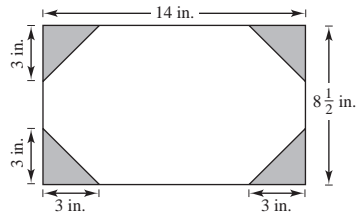
$$\begin{aligned}
 139. \quad (4 - 3i)(4 + 3i) &= 4^2 - (3i)^2 \\
 &= 16 + 9 \\
 &= 25
 \end{aligned}$$

$$143. \quad \frac{7}{3i} = \frac{7}{3i} \cdot \frac{-i}{-i} = \frac{-7i}{-3i^2} = \frac{-7i}{3}$$

$$\begin{aligned}
 147. \quad \frac{3 - 5i}{6 + i} &= \frac{3 - 5i}{6 + i} \cdot \frac{6 - i}{6 - i} \\
 &= \frac{18 - 3i - 30i + 5i^2}{6^2 - i^2} \\
 &= \frac{18 - 33i - 5}{36 + 1} \\
 &= \frac{13 - 33i}{37} \\
 &= \frac{13}{37} - \frac{33}{37}i
 \end{aligned}$$

$$149. c = \sqrt{3^2 + 3^2} = \sqrt{9 + 9} = \sqrt{18}$$

$$\begin{aligned} \text{Equation: } P &= 2(8) + 2\left(2\frac{1}{2}\right) + 4(\sqrt{18}) \\ &= 16 + 5 + 12\sqrt{2} \\ &= 21 + 12\sqrt{2} \text{ inches} \end{aligned}$$



$$151. \quad 1.3 = 2\pi\sqrt{\frac{L}{32}}$$

$$\frac{1.3}{2\pi} = \sqrt{\frac{L}{32}}$$

$$\left(\frac{1.3}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{32}}\right)^2$$

$$\frac{1.69}{4\pi^2} = \frac{L}{32}$$

$$\frac{1.69}{4\pi^2}(32) = L$$

$$1.3698624 = L \approx 1.37 \text{ feet}$$

$$155. \quad I = \sqrt{\frac{P}{R}}$$

$$15 = \sqrt{\frac{P}{40}}$$

$$15^2 = \left(\sqrt{\frac{P}{40}}\right)^2$$

$$225 = \frac{P}{40}$$

$$9000 \text{ watts} = P$$

$$153. \quad I = \sqrt{\frac{P}{R}}$$

$$5 = \sqrt{\frac{P}{20}}$$

$$5^2 = \left(\sqrt{\frac{P}{20}}\right)^2$$

$$25 = \frac{P}{20}$$

$$500 \text{ watts} = P$$

$$157. \quad v = \sqrt{2gh}$$

$$25 = \sqrt{2(32)h}$$

$$25^2 = \left(\sqrt{2(32)h}\right)^2$$

$$625 = 2(32)h$$

$$9.77 \text{ feet} \approx h$$

Chapter Test for Chapter 5

$$\begin{aligned} 1. \text{ (a) } 16^{3/2} &= (\sqrt{16})^3 \\ &= 4^3 \\ &= 64 \end{aligned}$$

$$\begin{aligned} 2. \text{ (a) } 27^{-2/3} &= \frac{1}{27^{2/3}} \\ &= \frac{1}{9} \end{aligned}$$

$$\begin{aligned} 3. \text{ (a) } \left(\frac{x^{1/2}}{x^{1/3}}\right)^2 &= \frac{x}{x^{2/3}} \\ &= x^{1-2/3} = x^{1/3} \end{aligned}$$

$$4. \text{ (a) } \sqrt{\frac{32}{9}} = \sqrt{\frac{16 \cdot 2}{9}} = \frac{4}{3}\sqrt{2}$$

$$\begin{aligned} \text{(b) } \sqrt{5}\sqrt{20} &= \sqrt{5 \cdot 20} \\ &= \sqrt{100} \\ &= 10 \end{aligned}$$

$$\begin{aligned} \text{(b) } \sqrt{2}\sqrt{18} &= \sqrt{2 \cdot 18} \\ &= \sqrt{36} \\ &= 6 \end{aligned}$$

$$\begin{aligned} \text{(b) } 5^{1/4} \cdot 5^{7/4} &= 5^{1/4+7/4} \\ &= 5^{8/4} = 5^2 = 25 \end{aligned}$$

$$\text{(b) } \sqrt[3]{24} = \sqrt[3]{8 \cdot 3} = 2\sqrt[3]{3}$$