

2. $\sqrt[3]{7^2} = 7^{2/3}$

5. $\sqrt[5]{5^3} = 5^{3/5}$

12. a) $\sqrt{7} \cdot \sqrt{28}$
 $\sqrt{7} \cdot \sqrt{4 \cdot 7}$
 $\sqrt{7} \cdot 2\sqrt{7}$
 $2 \cdot \sqrt{49}$
 $2 \cdot 7$
 14

b) $\frac{\sqrt{48}}{\sqrt{3}} = \sqrt{\frac{48}{3}} = \sqrt{16} = 4$

c) $\sqrt[4]{24} \cdot \sqrt[4]{54}$
 $\sqrt[4]{1296}$
 6

18. a) $\left(\frac{1}{16}\right)^{-0.75} = \left(\frac{1}{16}\right)^{-3/4} = (16)^{3/4} = (\sqrt[4]{16})^3 = 2^3 = 8$

b) $0.25^{-0.5} = \left(\frac{1}{4}\right)^{-1/2} = (4)^{1/2} = \sqrt{4} = 2$

c) $9^{1/3} \cdot 15^{1/3} \cdot 25^{1/3}$
 $(3^2)^{1/3} \cdot (3 \cdot 5)^{1/3} \cdot (5^2)^{1/3}$
 $3^{2/3} \cdot 3^{1/3} \cdot 5^{1/3} \cdot 5^{2/3}$
 $3^1 \cdot 5^1$
 15

24. $\sqrt{75} + \sqrt{48}$
 $\sqrt{25 \cdot 3} + \sqrt{16 \cdot 3}$
 $5\sqrt{3} + 4\sqrt{3}$
 $9\sqrt{3}$

28. $\sqrt{8} + \sqrt{50}$
 $\sqrt{4 \cdot 2} + \sqrt{25 \cdot 2}$
 $2\sqrt{2} + 5\sqrt{2}$
 $7\sqrt{2}$

38. $\sqrt{x^4 y^4}$
 $x^2 y^2$

48. $(8x^6)^{-2/3} = \left(\frac{1}{8x^6}\right)^{2/3} = \frac{1}{(\sqrt[3]{8x^6})^2} = \frac{1}{(2x^2)^2} = \frac{1}{4x^4}$

55. $\left(\frac{x^6 y}{y^4}\right)^{5/2} = \frac{x^{15} y^{5/2}}{y^{20/2}} = \frac{x^{15}}{y^{15/2}}$

$$62 \text{ a) } \frac{12}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{12\sqrt{3}}{3} = 4\sqrt{3} \quad \text{b) } \frac{5}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$$

$$\text{c) } \frac{2}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{6}}{6} = \frac{\sqrt{6}}{3}$$

$$63 \text{ a) } \frac{1}{\sqrt[3]{4}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}} = \frac{\sqrt[3]{2}}{\sqrt[3]{8}} = \frac{\sqrt[3]{2}}{2} \quad \text{b) } \frac{1}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{27}}{\sqrt[4]{27}} = \frac{\sqrt[4]{27}}{\sqrt[4]{81}} = \frac{\sqrt[4]{27}}{3}$$

$$\text{c) } \frac{8}{\sqrt[5]{2}} \cdot \frac{\sqrt[5]{16}}{\sqrt[5]{16}} = \frac{8\sqrt[5]{16}}{\sqrt[5]{32}} = \frac{8\sqrt[5]{16}}{2} = 4\sqrt[5]{16}$$

$$68. \text{ a) } s = \sqrt{30fd}$$

$$65 = \sqrt{30(6.4)(65)}$$

$$= 27.9284$$

$$\approx 28 \text{ mph}$$

$$\text{b) } 50 = \sqrt{30(.5)(d)}$$

$$50 = \sqrt{15d}$$

$$2500 = 15d$$

$$166.6 = d$$

$$167 \text{ ft} \approx d$$

$$69. \quad L = 60 \quad \text{a) } 0.30L + 0.38A^{\frac{1}{2}} - 3V^{\frac{1}{3}} \leq 16$$

Sail = 3400
displace = 650

$$.30(60) + .38(3400)^{\frac{1}{2}} - 3(650)^{\frac{1}{3}} \leq 16$$

$$18 + 22.1576172 - 25.98717316$$

$$14.17 \leq 16$$

yes

$$\text{b) } .30(65) + .38A^{\frac{1}{2}} - 3(600)^{\frac{1}{3}} \leq 16$$

$$19.5 + .38A^{\frac{1}{2}} - 25.30297996 \leq 16$$

$$\frac{.38A^{\frac{1}{2}}}{.38} \leq \frac{16 - 19.5 + 25.30297996}{.38}$$

$$(A^{\frac{1}{2}})^2 \leq (57.37626305)$$

$$A \leq 3292 \text{ ft}^2$$

$$71. \quad M = 1.99 \times 10^{30}$$

$$G = 6.67 \times 10^{-11}$$

$$\text{days} = 365.25 = 31,557,600 \text{ sec.}$$

$$d = \left(\frac{GM}{4\pi^2} \right)^{\frac{1}{3}} \cdot T^{\frac{2}{3}}$$

$$= \left(\frac{6.67 \times 10^{-11} \cdot 1.99 \times 10^{30}}{4\pi^2} \right)^{\frac{1}{3}} (31,557,600)^{\frac{2}{3}}$$

$$= \left(\frac{13.2733 \times 10^{19}}{39.4784176} \right)^{\frac{1}{3}} (99862.54842)$$

$$= (.6953546948 \cdot 10^{\frac{19}{3}}) \cdot \frac{9.986254842 \times 10^{\frac{12}{3}}}{3.94784176 \times 10^1}$$

$$= \frac{6.9439891886 \times 10^{\frac{31}{3}}}{3.94784176 \times 10^1} = .3377544814 \times 10^{24}$$

$$1.5 \times 10^{11}$$

$$\frac{12 \cdot 2}{4}$$

$$6.94 \times 10^{11}$$

Sect P.4 Day 2

P. 35 # 1, 3, 4, 10, 14, 16, 20, 23, 25, 26, 27, 30-36 (E), 37, 39-42, 44, 46, 50-56 (E), 64, 74, 28

$$\frac{1}{\sqrt{5}} = \frac{1}{5^{1/2}} = 5^{-1/2} \quad 3. 4^{2/3} = \sqrt[3]{4^2} = \sqrt[3]{16} \quad 4. 11^{-3/2} = \frac{1}{11^{3/2}} = \frac{1}{\sqrt{11^3}}$$

2. a) $\sqrt{64} = 8$ b) $\sqrt[3]{-64} = -4$ c) $\sqrt{-32} = -2$

4. a) $1024^{-0.1} = (2^{10})^{-0.1} = 2^{-1} = \frac{1}{2}$

b) $\left(\frac{-27}{8}\right)^{2/3} = \left(\sqrt[3]{\frac{-27}{8}}\right)^2 = \left(\frac{-3}{2}\right)^2 = \frac{9}{4}$

c) $\left(\frac{25}{64}\right)^{3/2} = \left(\sqrt{\frac{25}{64}}\right)^3 = \left(\frac{5}{8}\right)^3 = \frac{125}{512}$

6. a) $(-1000)^{-2/3} = [(-10)^3]^{-2/3} = (-10)^{-2} = \frac{1}{(-10)^2} = \frac{1}{100}$

b) $(10,000)^{-3/2} = (10^4)^{-3/2} = 10^{-6} = \frac{1}{10^6} = \frac{1}{1,000,000}$

c) $(-8000)^{4/3} = [(-20)^3]^{4/3} = (-20)^4 = 160,000$

20. $\sqrt[4]{x^3 + 14y + 2x}$ $x=3, y=4, z=-1$

$$\sqrt[4]{3^3 + 14(4) + 2(-1)}$$

$$\sqrt[4]{27 + 56 - 2}$$

$$\sqrt[4]{81}$$

3

$$23. \sqrt{32} + \sqrt{18}$$

$$\sqrt{16 \cdot 2} + \sqrt{9 \cdot 2}$$

$$4\sqrt{2} + 3\sqrt{2}$$

$$7\sqrt{2}$$

25. $\sqrt{125} - \sqrt{45}$

$$\sqrt{25 \cdot 5} - \sqrt{9 \cdot 5}$$

$$5\sqrt{5} - 3\sqrt{5}$$

$$2\sqrt{5}$$

26. $\sqrt[3]{54} - \sqrt[3]{16}$

$$\sqrt[3]{27 \cdot 2} - \sqrt[3]{8 \cdot 2}$$

$$3\sqrt[3]{2} - 2\sqrt[3]{2}$$

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

27. $\sqrt[3]{108} - \sqrt[3]{32}$

$$\sqrt[3]{27 \cdot 4} - \sqrt[3]{8 \cdot 4}$$

$$3\sqrt[3]{4} - 2\sqrt[3]{4}$$

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

$$30. \sqrt[3]{24} - \sqrt[3]{81}$$

$$\sqrt[3]{8 \cdot 3} - \sqrt[3]{27 \cdot 3}$$

$$2 \sqrt[3]{3} - 3 \sqrt[3]{3}$$

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

$$32. \sqrt[4]{48} - \sqrt[4]{3}$$

$$\sqrt[4]{16 \cdot 3} - \sqrt[4]{3}$$

$$2 \sqrt[4]{3} - 1 \sqrt[4]{3}$$

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

$$34. \sqrt[5]{x^{10}}$$

$$x^2$$

$$36. \sqrt[3]{x^3 y^6}$$

$$x y^2$$

* Careful here:
If variable goes
from even exponent
to odd exp then absolute
value

$$\text{ex. } \sqrt{y^6} = |y^3| \leftarrow$$

$$\sqrt{y^8} = y^4$$

$$37. \sqrt[3]{x^3 y}$$

$$x \sqrt[3]{y}$$

$$39. \sqrt[5]{a^6 b^7}$$

$$\sqrt[5]{a^5 b^5 \cdot ab^2}$$

$$|a| b \sqrt[5]{ab^2}$$

$$40. \sqrt[3]{a^2 b} \sqrt[3]{a^4 b}$$

$$\sqrt[3]{a^6 b^2}$$

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

$$41. \sqrt[3]{\sqrt[3]{64 x^6}}$$

$$\sqrt[3]{8 |x|^2}$$

$$2 |x| \sqrt[3]{2}$$

$$42. \sqrt[4]{x^4 y^2 z^2}$$

$$|x| \sqrt[4]{y^2 z^2}$$

$$44. (2x^{\frac{3}{2}})(4x)^{-\frac{1}{2}}$$

$$2x^{\frac{3}{2}} \cdot (2^2)^{-\frac{1}{2}} x^{-\frac{1}{2}}$$

$$2^1 x^{\frac{3}{2}} \cdot 2^{-1} x^{-\frac{1}{2}}$$

$$x$$

$$46. (-2 a^{\frac{3}{4}})(5 a^{\frac{3}{2}})$$

$$-10 a^{\frac{3}{4}} \cdot a^{\frac{6}{4}}$$

$$-10 a^{\frac{9}{4}}$$

$$50. (4x^6 y^8)^{\frac{3}{2}}$$

$$(\sqrt[2]{4})^3 x^9 y^{12}$$

$$8 x^9 y^{12}$$

$$52. \dots (a^{\frac{2}{5}})^{-\frac{3}{4}}$$

$$a^{-\frac{3}{10}} = \frac{1}{a^{\frac{3}{10}}}$$

$$54. (x^{-5} y^3 z^6)^{-\frac{3}{5}}$$

$$x^3 y^{-\frac{9}{5}} z^{-6}$$

$$\frac{x^3}{y^{\frac{9}{5}} z^6}$$

$$56. \left(\frac{-2x^{\frac{1}{3}}}{y^{\frac{1}{2}} z^{\frac{1}{6}}} \right)^4 = \frac{(-2)^4 x^{\frac{4}{3}}}{y^2 z^{\frac{2}{3}}} = \frac{16 x^{\frac{4}{3}}}{y^2 z^{\frac{2}{3}}}$$

$$64. a) \frac{1}{\sqrt[5]{2^3}} \cdot \frac{\sqrt[5]{2^2}}{\sqrt[5]{2^2}} = \frac{\sqrt[5]{4}}{\sqrt[5]{2^5}} = \frac{\sqrt[5]{4}}{2}$$

$$b) \frac{2}{\sqrt[4]{3}} \cdot \frac{\sqrt[4]{3^3}}{\sqrt[4]{3^3}} = \frac{2 \sqrt[4]{27}}{\sqrt[4]{3^4}} = \frac{2 \sqrt[4]{27}}{3}$$

$$c) \frac{3}{\sqrt[4]{2^3}} \cdot \frac{\sqrt[4]{2^1}}{\sqrt[4]{2^1}} = \frac{3 \sqrt[4]{2}}{\sqrt[4]{2^4}} = \frac{3 \sqrt[4]{2}}{2}$$

p. 35 (cont)

Larger?

74.

a) $(2\frac{1}{2})^{\sqrt{2}}$ or $2^{\sqrt[3]{2}}$

b) $(\frac{1}{2})^{\frac{1}{2}}$ or $(\frac{1}{2})^{\frac{1}{3}}$
 ${}^2\sqrt{\frac{1}{2}}$ or ${}^3\sqrt{\frac{1}{2}}$
 $\frac{1}{4}$

d) ${}^3\sqrt{5}$ or $(\sqrt{3})^{\frac{1}{2}}$
 $5^{\frac{1}{3}}$ or $3^{\frac{1}{2}}$
 $5^{\frac{2}{6}}$ or $3^{\frac{3}{6}}$
 ${}^6\sqrt{25}$ or $({}^6\sqrt{27})^{\frac{1}{2}}$

e) $(7^{\frac{1}{4}})^{\sqrt{7}}$ or $4^{\frac{1}{3}}$

$7^{\frac{3}{12}}$ or $4^{\frac{4}{12}}$
 ${}^{12}\sqrt{343}$ or ${}^{12}\sqrt{256}$

$\frac{28}{6}$
 $\frac{3}{649}$
 $\frac{7}{3}$