

42. $\sin 157^\circ 30' = \frac{\sqrt{2-\sqrt{2}}}{2}$

$\cos 157^\circ 30' = -\frac{\sqrt{2+\sqrt{2}}}{2}$

$\tan 157^\circ 30' = 1 - \sqrt{2}$

44. $\sin \frac{\pi}{12} = \frac{\sqrt{2-\sqrt{3}}}{2}$

$\cos \frac{\pi}{12} = \frac{\sqrt{2+\sqrt{3}}}{2}$

$\tan \frac{\pi}{12} = 2 - \sqrt{3}$

48. $\sin \frac{u}{2} = \frac{3}{5}$

$\cos \frac{u}{2} = \frac{4}{5}$

$\tan \frac{u}{2} = \frac{3}{4}$

46. $\sin \frac{7\pi}{12} = \frac{\sqrt{2+\sqrt{3}}}{2}$

$\cos \frac{7\pi}{12} = -\frac{\sqrt{2-\sqrt{3}}}{2}$

$\tan \frac{7\pi}{12} = -2 - \sqrt{3}$

50. $\sin \frac{u}{2} = \frac{\sqrt{50+7\sqrt{50}}}{10}$

$\cos \frac{u}{2} = -\frac{\sqrt{50-7\sqrt{50}}}{10}$

$\tan \frac{u}{2} = -\sqrt{50} - 7$

52. $|\cos 2x|$ 54. $-\left|\sin \frac{x-1}{2}\right|$ 56. $0, \frac{\pi}{3}, \frac{5\pi}{3}$

58. $0, \frac{\pi}{2}, \frac{3\pi}{2}$ 60. $2\left(\sin \frac{7\pi}{6} - \sin \frac{\pi}{2}\right)$

62. $\frac{5}{2}(\cos \alpha - \cos 7\alpha)$ 64. $\frac{1}{2}(\cos 2\theta + \cos 6\theta)$

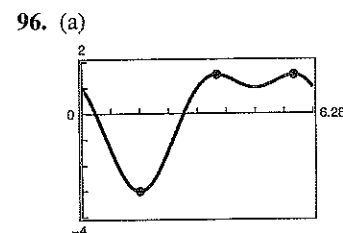
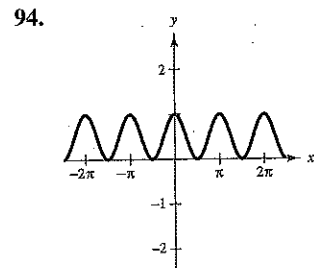
66. $2 \cos 75^\circ \cos 45^\circ$ 68. $2 \sin 4x \cos 3x$

70. $2 \cos(\phi + \pi) \cos \pi = -2 \cos(\phi + \pi)$

72. $2 \sin x \cos \frac{\pi}{2} = 0$ 74. $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}$

76. $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}$ 78. $\frac{144}{169}$

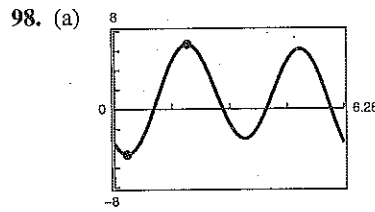
80. $\frac{36}{65}$ 82.-92. Answers will vary.



Minimum: $\left(\frac{\pi}{2}, -3\right)$

Maxima: $\left(\frac{7\pi}{6}, \frac{3}{2}\right), \left(\frac{11\pi}{6}, \frac{3}{2}\right)$

(b) $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$



Minimum: (0.3434, -4.6340)

Maximum: (1.9907, 6.6705)

(b) 0.3434, 1.9907, 3.5443, 5.0640

100. $2x^2 - 1$ 102. $\frac{2x}{x^2 + 1}$

104. (a) Area = $100 \sin \frac{\theta}{2} \cos \frac{\theta}{2}$

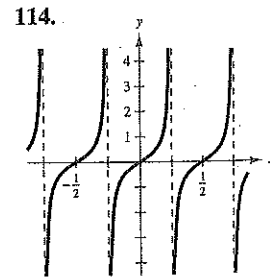
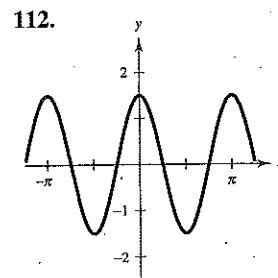
(b) Area = $50 \sin \theta$

The area is maximum when $\theta = \pi/2$; Area = 50.

106. $x = 2r(1 - \cos \theta)$ 108. True

110. (a) Complement: 35° ; Supplement: 125°

(b) Complement: none; Supplement: 18°



Review Exercises (page 422)

2. $\csc x$ 4. $\cot x$ 6. $\sec x$ 8. $\tan x$

10. $-\tan x$

12. $\sin \theta = \frac{3\sqrt{13}}{13}$

$\cos \theta = \frac{2\sqrt{13}}{13}$

$\csc \theta = \frac{\sqrt{13}}{3}$

$\cot \theta = \frac{2}{3}$

14. $\cos \theta = \frac{1}{3}$

$\tan \theta = 2\sqrt{2}$

$\csc \theta = \frac{3\sqrt{2}}{4}$

$\sec \theta = 3$

$\cot \theta = \frac{\sqrt{2}}{4}$

16. $\frac{1}{\cos x} + 1$

18. $1 - \sin \beta \cos \beta$

20. 1

22. -

40. $\frac{3\pi}{4}$

46. $\frac{\pi}{6}$

52. $\frac{\pi}{6}$

58. Nc

62. $\frac{\pi}{2}$

66. \sin

\cos

\tan

70. \cos

76. $\frac{12\sqrt{}}$

80.-84.

88.-92.

94. $\sin 2t$

$\cos 2$

$\tan 2t$

96. $\frac{1}{32}(10$

98. $\frac{1}{8}(3 +$

100. $\sin 10$

$\cos 10$

$\tan 10^\circ$

102. $\sin \frac{7\pi}{8}$

$\cos \frac{7\pi}{8}$

$\tan \frac{7\pi}{8}$

104. $-\cos 5$

108. (a) $V =$

(b) $V =$

Volume j

22. -1 24.-38. Answers will vary.

40. $\frac{3\pi}{4}, \frac{7\pi}{4}$ 42. $\frac{\pi}{3}, \frac{5\pi}{3}$ 44. $\frac{\pi}{3}, \frac{5\pi}{3}$

46. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ 48. $0, \pi, \frac{3\pi}{2}$ 50. $\frac{\pi}{3}, \frac{5\pi}{3}$

52. $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}$ 54. 0 56. $0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}, \frac{5\pi}{3}$

58. No solution 60. $0, \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \pi, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$

62. $\frac{\pi}{2}, \frac{3\pi}{2}$ 64. 1.7682, $\frac{3\pi}{4}, 4.9098, \frac{7\pi}{4}$

66. $\sin 345^\circ = \frac{\sqrt{2} - \sqrt{6}}{4}$ 68. $\sin \frac{19\pi}{12} = \frac{-\sqrt{2} - \sqrt{6}}{4}$

$\cos 345^\circ = \frac{\sqrt{2} + \sqrt{6}}{4}$ $\cos \frac{19\pi}{12} = \frac{\sqrt{6} - \sqrt{2}}{4}$

$\tan 345^\circ = \sqrt{3} - 2$ $\tan \frac{19\pi}{12} = -2 - \sqrt{3}$

70. $\cos 40^\circ$ 72. $-\tan 47^\circ$ 74. $\frac{-15\sqrt{7} - 84}{35 - 36\sqrt{7}}$

76. $\frac{12\sqrt{7} - 15}{52}$ 78. $\frac{84 - 15\sqrt{7}}{35 + 36\sqrt{7}}$

80.-84. Answers will vary. 86. $0, \pi$

88.-92. Answers will vary.

94. $\sin 2u = -\frac{4}{5}$

$\cos 2u = \frac{3}{5}$

$\tan 2u = -\frac{4}{3}$

96. $\frac{1}{32}(10 - 15 \cos 2x + 6 \cos 4x - \cos 6x)$

98. $\frac{1}{8}(3 + 4 \cos 4x + \cos 8x)$

100. $\sin 105^\circ = \frac{\sqrt{2} + \sqrt{3}}{2}$

$\cos 105^\circ = -\frac{\sqrt{2} - \sqrt{3}}{2}$

$\tan 105^\circ = -2 - \sqrt{3}$

102. $\sin \frac{7\pi}{8} = \frac{\sqrt{2} - \sqrt{2}}{2}$

$\cos \frac{7\pi}{8} = -\frac{\sqrt{2} + \sqrt{2}}{2}$

$\tan \frac{7\pi}{8} = 1 - \sqrt{2}$

104. $-|\cos 5x|$ 106. Answers will vary.

108. (a) $V = \sin \frac{\theta}{2} \cos \frac{\theta}{2}$ cubic meters

(b) $V = \frac{1}{2} \sin \theta$ cubic meters

Volume is maximum when $\theta = \pi/2$.

110. $2 \cos 4\theta \sin \theta$ 112. $2 \cos x \sin \frac{\pi}{4}$

114. $\frac{3}{2}(\cos x - \cos 5x)$ 116. $\frac{1}{2}\left(\cos \frac{x}{4} + \cos \frac{3x}{4}\right)$

118. False. $\cos \frac{\theta}{2} > 0$ 120. True

122. Answers will vary. 124. $y_3 = y_2 + 1$

Chapter 6

Section 6.1 (page 434)

2. $A = 15^\circ, a \approx 4.48, b \approx 12.25$

4. $A = 35^\circ, a \approx 36.50, b \approx 11.05$

6. Two solutions

$C \approx 74.21^\circ, B \approx 45.79^\circ, b \approx 7.45$

$C \approx 105.79^\circ, B \approx 14.21^\circ, b \approx 2.55$

8. $B = 101.1^\circ, a \approx 1.35, b \approx 3.23$

10. $C = 166^\circ 5', a \approx 3.30, c \approx 8.05$

12. $A \approx 44.24^\circ, B \approx 50.43^\circ, b \approx 38.67$

14. $C \approx 2.57^\circ, A \approx 174.68^\circ, a \approx 11.98$

16. No solution

18. Two solutions

$B \approx 70.44^\circ, C \approx 51.56^\circ, c \approx 4.16$

$B \approx 109.56^\circ, C \approx 12.44^\circ, c \approx 1.14$

20. $B \approx 38.02^\circ, C \approx 1.98^\circ, c \approx 2.58$

22. (a) $b \leq 10, b = \frac{10}{\sin 60^\circ}$

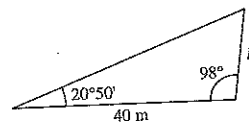
(b) $10 < b < \frac{10}{\sin 60^\circ}$ (c) $b > \frac{10}{\sin 60^\circ}$

24. 2878.364 square units

26. 4.529 square units

28. 159.263 square units

30. (a)

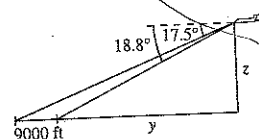


(b) $\frac{h}{\sin 20^\circ 50'} = \frac{40}{\sin 61^\circ 10'}$

(c) Slant height ≈ 16.24 meters

32. ≈ 77 meters

34. (a)



(c) ≈ 21.4 miles (d) $\approx 38,443$ feet

(b) ≈ 22.6 miles