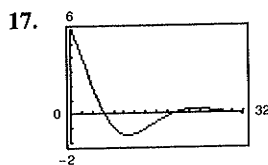
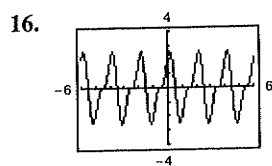
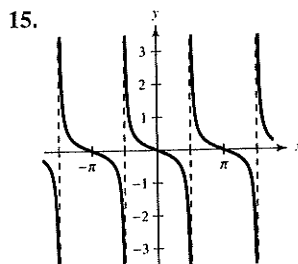
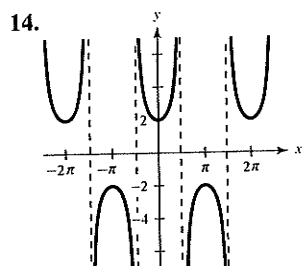
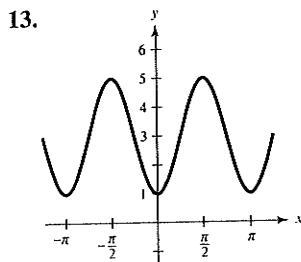
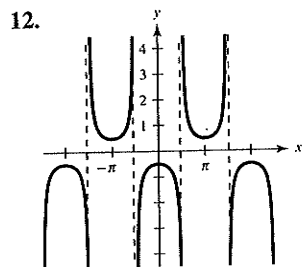
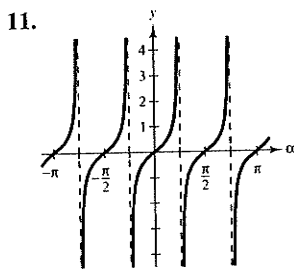
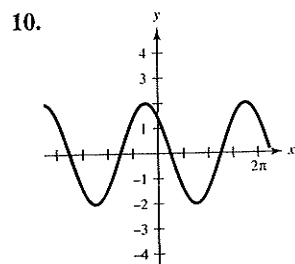


Chapter 5

Section 5.1 (page 345)

Vocabulary Check (page 345)

1.  $\sec u$    2.  $\tan u$    3.  $\cot u$    4.  $\csc u$   
 5.  $\cot^2 u$    6.  $\sec^2 u$    7.  $\sin u$    8.  $\csc u$   
 9.  $-\sin u$    10.  $\cos u$

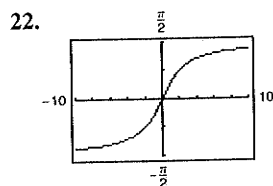
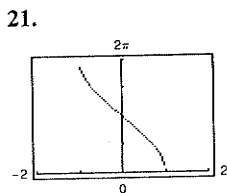
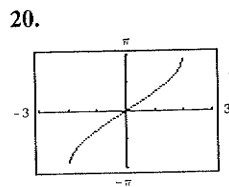


Period: 2

Not periodic

18.  $y = -2 \sin\left(\frac{x}{2} - \frac{\pi}{4}\right)$

19.  $\frac{\sqrt{5}}{2}$



23. S 34.5° W

1.  $\tan x = \sqrt{3}$

3.  $\cos \theta = \frac{\sqrt{2}}{2}$

$\csc x = \frac{2\sqrt{3}}{3}$

$\tan \theta = -1$

$\sec x = 2$

$\csc \theta = -\sqrt{2}$

$\cot x = \frac{\sqrt{3}}{3}$

$\cot \theta = -1$

5.  $\sin x = -\frac{7}{25}$

7.  $\cos \phi = -\frac{12}{13}$

$\cos x = -\frac{24}{25}$

$\tan \phi = -\frac{5}{12}$

$\csc x = -\frac{25}{7}$

$\csc \phi = \frac{13}{5}$

$\cot x = \frac{24}{7}$

$\cot \phi = -\frac{12}{5}$

9.  $\sin x = \frac{2}{3}$

11.  $\sin \theta = -\frac{2\sqrt{5}}{5}$

$\cos x = -\frac{\sqrt{5}}{3}$

$\cos \theta = -\frac{\sqrt{5}}{5}$

$\csc x = \frac{3}{2}$

$\csc \theta = -\frac{\sqrt{5}}{2}$

$\sec x = -\frac{3\sqrt{5}}{5}$

$\sec \theta = -\sqrt{5}$

$\cot x = -\frac{\sqrt{5}}{2}$

$\cot \theta = \frac{1}{2}$

13.  $\sin \theta = 0$

$\cos \theta = -1$

$\tan \theta = 0$

$\sec \theta = -1$

$\cot \theta$  is undefined

15. d   16. a   17. b   18. f   19. e

20. c   21. b   22. c   23. f   24. a

25. e   26. d   27.  $\cos x$    29.  $\cos^2 \phi$

31.  $\cos x$    33. 1   35.  $\cot x$    37.  $1 + \sin y$

39-49. Answers will vary.   51.  $\cos^2 x$    53.  $\cos x + 2$

55.  $\sec^4 x$    57.  $\sin^2 x - \cos^2 x$    59.  $(\csc x - 1) \cot^2$

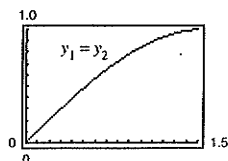
61.  $1 + 2 \sin x \cos x$    63.  $\tan^2 x$    65.  $2 \csc^2 x$

67.  $-\cot x$     69.  $1 + \cos y$     71.  $3(\sec x + \tan x)$

73.

$x$	0.2	0.4	0.6	0.8
$y_1$	0.1987	0.3894	0.5646	0.7174
$y_2$	0.1987	0.3894	0.5646	0.7174

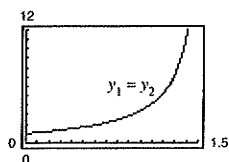
$x$	1.0	1.2	1.4
$y_1$	0.8415	0.9320	0.9854
$y_2$	0.8415	0.9320	0.9854



75.

$x$	0.2	0.4	0.6	0.8
$y_1$	1.2230	1.5085	1.8958	2.4650
$y_2$	1.2230	1.5085	1.8958	2.4650

$x$	1.0	1.2	1.4
$y_1$	3.4082	5.3319	11.6814
$y_2$	3.4082	5.3319	11.6814



77.  $\csc x$     79.  $\tan x$     81.  $5 \cos \theta$     83.  $3 \tan \theta$

85.  $0 \leq \theta \leq \pi$     87.  $0 \leq \theta < \frac{\pi}{2}, \frac{3\pi}{2} < \theta < 2\pi$

89.  $\ln|\cot \theta|$     91.  $\ln|(\cos x)(1 + \sin x)|$

93. (a)  $\csc^2(132^\circ) - \cot^2(132^\circ) \approx 1.8107 - 0.8107 = 1$

(b)  $\csc^2\left(\frac{2\pi}{7}\right) - \cot^2\left(\frac{2\pi}{7}\right) \approx 1.63596 - 0.63596 = 1$

95. (a)  $\cos(90^\circ - 80^\circ) = \cos(10^\circ) \approx 0.9848$ ;

$\sin(80^\circ) \approx 0.9848$

(b)  $\cos\left(\frac{\pi}{2} - 0.8\right) \approx 0.7174$ ;  $\sin(0.8) \approx 0.7174$

97. Answers will vary.    99. True, for all  $\theta \neq n\pi$ .

101. 1, 1    103.  $\infty, 0$

105.  $\cos \theta = \pm \sqrt{1 - \sin^2 \theta}$

$\tan \theta = \pm \frac{\sin \theta}{\sqrt{1 - \sin^2 \theta}}$

$\csc \theta = \frac{1}{\sin \theta}$

$\sec \theta = \pm \frac{1}{\sqrt{1 - \sin^2 \theta}}$

$\cot \theta = \pm \frac{\sqrt{1 - \sin^2 \theta}}{\sin \theta}$

The sign depends on the choice of  $\theta$ .

107. Answers will vary. Sample answer:

$\sin \theta = \frac{o}{h}$

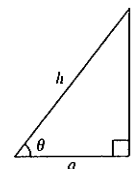
$\cos \theta = \frac{a}{h}$

$o^2 + a^2 = h^2$

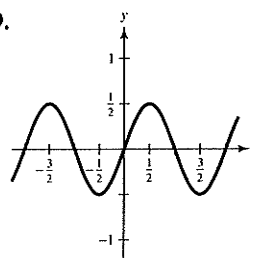
$\frac{o^2}{h^2} + \frac{a^2}{h^2} = 1$

$\left(\frac{o}{h}\right)^2 + \left(\frac{a}{h}\right)^2 = 1$

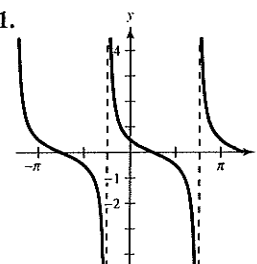
$\sin^2 \theta + \cos^2 \theta = 1$



109.



111.



Section 5.2 (page 353)

Vocabulary Check (page 353)

1. conditional    2. identity    3.  $\cot u$     4.  $\sin u$

5.  $\tan u$     6.  $\cos u$     7.  $\cos^2 u$     8.  $\cos u$

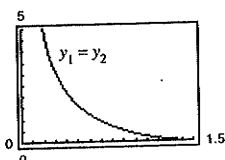
9.  $-\tan u$     10.  $\sec u$

1-9. Answers will vary.

11.

x	0.2	0.4	0.6	0.8
y <sub>1</sub>	4.8348	2.1785	1.2064	0.6767
y <sub>2</sub>	4.8348	2.1785	1.2064	0.6767

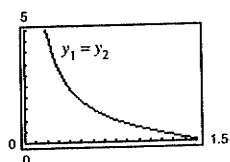
x	1.0	1.2	1.4
y <sub>1</sub>	0.3469	0.1409	0.0293
y <sub>2</sub>	0.3469	0.1409	0.0293



13.

x	0.2	0.4	0.6	0.8
y <sub>1</sub>	4.8348	2.1785	1.2064	0.6767
y <sub>2</sub>	4.8348	2.1785	1.2064	0.6767

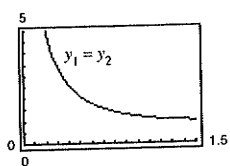
x	1.0	1.2	1.4
y <sub>1</sub>	0.3469	0.1409	0.0293
y <sub>2</sub>	0.3469	0.1409	0.0293



15.

x	0.2	0.4	0.6	0.8
y <sub>1</sub>	5.0335	2.5679	1.7710	1.3940
y <sub>2</sub>	5.0335	2.5679	1.7710	1.3940

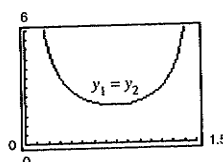
x	1.0	1.2	1.4
y <sub>1</sub>	1.1884	1.0729	1.0148
y <sub>2</sub>	1.1884	1.0729	1.0148



17.

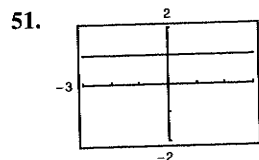
x	0.2	0.4	0.6	0.8
y <sub>1</sub>	5.1359	2.7880	2.1458	2.0009
y <sub>2</sub>	5.1359	2.7880	2.1458	2.0009

x	1.0	1.2	1.4
y <sub>1</sub>	2.1995	2.9609	5.9704
y <sub>2</sub>	2.1995	2.9609	5.9704

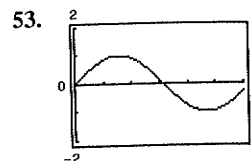


19.  $\cot(-x) = -\cot(x)$ , so  
 $(1 + \tan x)[1 + \cot(-x)] = \tan x - \cot x$ .

21-49. Answers will vary.



$y = 1$



$y = \sin x$

55 and 57. Answers will vary. 59. 1 61. 2

63 and 65. Answers will vary. 67.  $\mu = \tan \theta, W \neq 0$

69. True 71. False.  $\sin^2\left(\frac{\pi}{4}\right) + \cos^2\left(\frac{\pi}{4}\right) \neq 1 + \tan^2\left(\frac{\pi}{4}\right)$

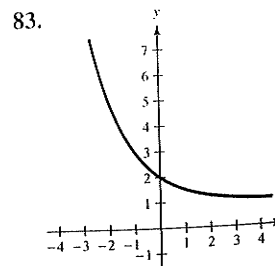
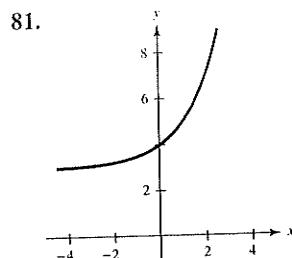
73.  $\sqrt{\tan^2 x} = |\tan x|; \frac{3\pi}{4}$  75. Answers will vary.

77. Answers will vary.

Sample answer:  $y = x^3 - x^2 + 64x - 64$

79. Answers will vary.

Sample answer:  $y = x^3 - 16x^2 + 85x - 148$



85. Quadrant II 87. Quadrant IV

89.  $A = 10^\circ$       91.  $A = 60.26^\circ$   
 $b \approx 90.74$        $B \approx 29.74^\circ$   
 $c \approx 92.14$        $c \approx 16.12$

Section 5.3 (page 364)

Vocabulary Check (page 364)

1. general    2. quadratic    3. extraneous

1-5. Answers will vary.    7.  $\frac{2\pi}{3} + 2n\pi, \frac{4\pi}{3} + 2n\pi$

9.  $\frac{\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi$

11.  $\frac{\pi}{3} + n\pi, \frac{2\pi}{3} + n\pi$     13.  $\frac{\pi}{3} + n\pi, \frac{2\pi}{3} + n\pi$

15.  $\frac{\pi}{3} + n\pi, \frac{2\pi}{3} + n\pi$     17.  $\frac{2\pi}{3}, \frac{5\pi}{3}$

19.  $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$     21.  $0, \frac{\pi}{6}, \frac{5\pi}{6}, \pi, \frac{7\pi}{6}, \frac{11\pi}{6}$

23.  $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$     25. No solution    27.  $\frac{\pi}{3}, \frac{5\pi}{3}$

29. 2.0344, 5.1760,  $\frac{\pi}{4}, \frac{5\pi}{4}$     31. 3.6652, 4.7124, 5.7596

33. 0.8614, 5.4218    35. 1.5708    37. 0.5236, 2.6180

39.  $\frac{2\pi}{3} + n\pi, \frac{5\pi}{6} + n\pi$     41.  $\frac{\pi}{8} + \frac{n\pi}{4}$

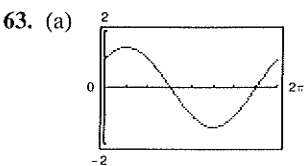
43.  $\frac{n\pi}{3}, \frac{\pi}{4} + n\pi$     45.  $\frac{\pi}{2} + 4n\pi, \frac{7\pi}{2} + 4n\pi$     47. -1, 3

49.  $\pm 2$     51. 1.1071, 4.2487    53. 0.8603, 3.4256

55. 0, 2.6779, 3.1416, 5.8195

57. 0.3398, 0.8481, 2.2935, 2.8018    59. -1.154, 0.534

61. 1.110



Maximum: (0.785, 1.41)

Minimum: (3.93, -1.41)

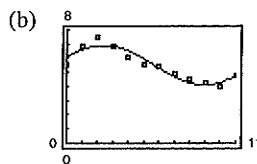
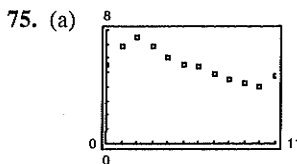
(b)  $\frac{\pi}{4}, \frac{5\pi}{4}$

65. 1

67. (a) All real numbers  $x$  except  $x = 0$   
 (b)  $y$ -axis symmetry; horizontal asymptote:  $y = 1$   
 (c) Oscillates    (d) Infinite number of solutions  
 (e) Yes. 0.6366

69. 0.04 second, 0.43 second, 0.83 second

71. May, June, July    73.  $37^\circ, 53^\circ$



The model fits the data.

- (c) The constant term; 5.51%  
 (d) Approximately 13 years  
 (e) 2007
77. False. Reasons will vary.  
 79. False. The domain of the sine function does not include 3.4.  
 81. 2.164 rad    83.  $-0.007$  rad  
 85. 24.249    87. 2290.4 feet

Section 5.4 (page 372)

Vocabulary Check (page 372)

1.  $\sin u \cos v - \cos u \sin v$   
 2.  $\cos u \cos v - \sin u \sin v$     3.  $\frac{\tan u + \tan v}{1 - \tan u \tan v}$   
 4.  $\sin u \cos v + \cos u \sin v$   
 5.  $\cos u \cos v + \sin u \sin v$     6.  $\frac{\tan u - \tan v}{1 + \tan u \tan v}$

1. (a)  $-\frac{1}{2}$     (b)  $-\frac{3}{2}$     3. (a) 0    (b)  $\frac{1 + \sqrt{3}}{2}$

5. (a)  $\frac{-\sqrt{2} - \sqrt{6}}{4}$     (b)  $\frac{-\sqrt{2} - \sqrt{3}}{2}$

7.  $\sin 105^\circ = \frac{\sqrt{6} + \sqrt{2}}{4}$

$\cos 105^\circ = \frac{\sqrt{2} - \sqrt{6}}{4}$

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

11.  $\sin \frac{11\pi}{12} = \frac{\sqrt{6} - \sqrt{2}}{4}$

$\cos \frac{11\pi}{12} = \frac{-\sqrt{6} - \sqrt{2}}{4}$

$\tan \frac{11\pi}{12} = -2 + \sqrt{3}$

13.  $\sin\left(-\frac{\pi}{12}\right) = \frac{\sqrt{2} - \sqrt{6}}{4}$

$\cos\left(-\frac{\pi}{12}\right) = \frac{\sqrt{6} + \sqrt{2}}{4}$

$\tan\left(-\frac{\pi}{12}\right) = -2 + \sqrt{3}$

17.  $\sin(-225^\circ) = \frac{\sqrt{2}}{2}$

$\cos(-225^\circ) = -\frac{\sqrt{2}}{2}$

$\tan(-225^\circ) = -1$

19.  $\sin \frac{13\pi}{12} = \frac{-\sqrt{6} + \sqrt{2}}{4}$

$\cos \frac{13\pi}{12} = \frac{-\sqrt{6} - \sqrt{2}}{4}$

$\tan \frac{13\pi}{12} = 2 - \sqrt{3}$

21.  $\sin\left(-\frac{7\pi}{12}\right) = -\frac{\sqrt{6} + \sqrt{2}}{4}$

$\cos\left(-\frac{7\pi}{12}\right) = \frac{\sqrt{2} - \sqrt{6}}{4}$

$\tan\left(-\frac{7\pi}{12}\right) = 2 + \sqrt{3}$

23.  $\cos 70^\circ$     25.  $\tan 239^\circ$

27.  $\sin 2.3$     29.  $\cos \frac{12\pi}{35}$

9.  $\sin 195^\circ = \frac{\sqrt{2} - \sqrt{6}}{4}$

$\cos 195^\circ = \frac{-\sqrt{2} - \sqrt{6}}{4}$

$\tan 195^\circ = 2 - \sqrt{3}$

15.  $\sin 75^\circ = \frac{\sqrt{2} + \sqrt{6}}{4}$

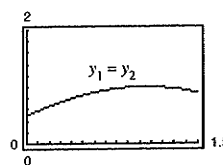
$\cos 75^\circ = \frac{\sqrt{6} - \sqrt{2}}{4}$

$\tan 75^\circ = \sqrt{3} + 2$

31.

x	0.2	0.4	0.6	0.8
y <sub>1</sub>	0.6621	0.7978	0.9017	0.9696
y <sub>2</sub>	0.6621	0.7978	0.9017	0.9696

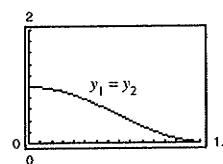
x	1.0	1.2	1.4
y <sub>1</sub>	0.9989	0.9883	0.9384
y <sub>2</sub>	0.9989	0.9883	0.9384



33.

x	0.2	0.4	0.6	0.8
y <sub>1</sub>	0.9605	0.8484	0.6812	0.4854
y <sub>2</sub>	0.9605	0.8484	0.6812	0.4854

x	1.0	1.2	1.4
y <sub>1</sub>	0.2919	0.1313	0.0289
y <sub>2</sub>	0.2919	0.1313	0.0289



35.  $-\frac{63}{65}$     37.  $-\frac{63}{16}$     39.  $\frac{3}{5}$     41.  $\frac{44}{125}$     43. 1

45.  $\frac{2x^2 - \sqrt{1-x^2}}{\sqrt{4x^2+1}}$     47-53. Answers will vary.

55.  $\frac{\pi}{2}$     57.  $0, \frac{\pi}{3}, \pi, \frac{5\pi}{3}$     59. 0.7854, 5.4978

61. 0, 3.1416    63. Answers will vary.

65. False.  $\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$

67 and 69. Answers will vary.

71. (a)  $\sqrt{2} \sin\left(\theta + \frac{\pi}{4}\right)$     (b)  $\sqrt{2} \cos\left(\theta - \frac{\pi}{4}\right)$

73. (a)  $13 \sin(3\theta + 0.3948)$     (b)  $13 \cos(3\theta - 1.1760)$

75.  $2 \cos \theta$     77. Answers will vary.

79.  $u + v = w$ . Answers will vary.    81. (0, 19), (38, 0)

83. (0, 4), (2, 0), (7, 0)    85.  $\frac{\pi}{6}$     87.  $\frac{\pi}{2}$

Section 5.5 (page 382)

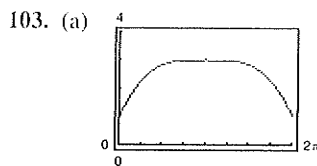
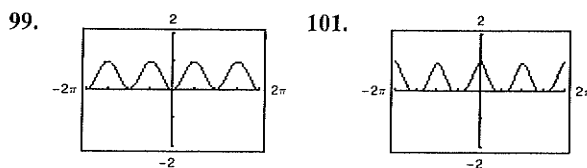
**Vocabulary Check** (page 382)

1.  $2 \sin u \cos u$     2.  $\frac{1 + \cos 2u}{2}$     3.  $\cos 2u$   
 4.  $\tan \frac{u}{2}$     5.  $\frac{2 \tan u}{1 - \tan^2 u}$   
 6.  $\frac{1}{2}[\cos(u - v) + \cos(u + v)]$     7.  $\sin^2 u$   
 8.  $\cos \frac{u}{2}$     9.  $\frac{1}{2}[\sin(u + v) + \sin(u - v)]$   
 10.  $2 \sin\left(\frac{u + v}{2}\right) \cos\left(\frac{u - v}{2}\right)$

1.  $\frac{3}{5}$     3.  $\frac{7}{25}$     5.  $\frac{24}{7}$     7.  $\frac{25}{24}$   
 9. 0, 1.0472, 3.1416, 5.2360; 0,  $\frac{\pi}{3}$ ,  $\pi$ ,  $\frac{5\pi}{3}$   
 11. 0.2618, 1.3090, 3.4034, 4.4506;  $\frac{\pi}{12}$ ,  $\frac{5\pi}{12}$ ,  $\frac{13\pi}{12}$ ,  $\frac{17\pi}{12}$   
 13. 0, 2.0944, 4.1888; 0,  $\frac{2\pi}{3}$ ,  $\frac{4\pi}{3}$   
 15. 0, 1.5708, 3.1416, 4.7124; 0,  $\frac{\pi}{2}$ ,  $\pi$ ,  $\frac{3\pi}{2}$   
 17.  $\sin 2u = \frac{24}{25}$     19.  $\sin 2u = \frac{4}{5}$   
      $\cos 2u = \frac{7}{25}$              $\cos 2u = \frac{3}{5}$   
      $\tan 2u = \frac{24}{7}$              $\tan 2u = \frac{4}{3}$   
 21.  $\sin 2u = -\frac{4\sqrt{21}}{25}$   
      $\cos 2u = -\frac{17}{25}$   
      $\tan 2u = \frac{4\sqrt{21}}{17}$   
 23.  $4 \sin 2x$     25.  $6 \cos 2x$   
 27.  $\frac{1}{8}(3 + 4 \cos 2x + \cos 4x)$     29.  $\frac{1}{8}(1 - \cos 4x)$   
 31.  $\frac{1}{32}(2 + \cos 2x - 2 \cos 4x - \cos 6x)$   
 33.  $\frac{4\sqrt{17}}{17}$     35.  $\frac{1}{4}$     37.  $\sqrt{17}$     39.  $\frac{8}{17}$   
 41.  $\sin 15^\circ = \frac{\sqrt{2 - \sqrt{3}}}{2}$     43.  $\sin 112^\circ 30' = \frac{\sqrt{2 + \sqrt{2}}}{2}$   
      $\cos 15^\circ = \frac{\sqrt{2 + \sqrt{3}}}{2}$              $\cos 112^\circ 30' = -\frac{\sqrt{2 - \sqrt{2}}}{2}$   
      $\tan 15^\circ = 2 - \sqrt{3}$              $\tan 112^\circ 30' = -1 - \sqrt{2}$

45.  $\sin \frac{\pi}{8} = \frac{\sqrt{2 - \sqrt{2}}}{2}$     47.  $\sin \frac{3\pi}{8} = \frac{\sqrt{2 + \sqrt{2}}}{2}$   
      $\cos \frac{\pi}{8} = \frac{\sqrt{2 + \sqrt{2}}}{2}$              $\cos \frac{3\pi}{8} = \frac{\sqrt{2 - \sqrt{2}}}{2}$   
      $\tan \frac{\pi}{8} = \sqrt{2} - 1$              $\tan \frac{3\pi}{8} = \sqrt{2} + 1$   
 49.  $\sin \frac{u}{2} = \frac{5\sqrt{26}}{26}$     51.  $\sin \frac{u}{2} = \sqrt{\frac{89 - 5\sqrt{89}}{178}}$   
      $\cos \frac{u}{2} = \frac{\sqrt{26}}{26}$              $\cos \frac{u}{2} = -\sqrt{\frac{89 + 5\sqrt{89}}{178}}$   
      $\tan \frac{u}{2} = 5$              $\tan \frac{u}{2} = \frac{5 - \sqrt{89}}{8}$   
 53.  $\sin \frac{u}{2} = \frac{3\sqrt{10}}{10}$   
      $\cos \frac{u}{2} = -\frac{\sqrt{10}}{10}$   
      $\tan \frac{u}{2} = -3$   
 55.  $|\sin 3x|$     57.  $-\tan 4x$     59.  $\frac{\pi}{3}, \frac{5\pi}{3}$   
 61.  $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$     63.  $3 \sin \frac{2\pi}{3}$     65.  $\frac{1}{2}(\sin 8\theta + \sin 2\theta)$   
 67.  $\frac{5}{2}(\cos 8\beta + \cos 2\beta)$     69.  $2 \cos 3\theta \sin 2\theta$   
 71.  $2 \cos \alpha \sin \beta$     73.  $-2 \sin \theta \sin \frac{\pi}{2} = -2 \sin \theta$   
 75.  $\frac{\sqrt{2}}{2}$     77.  $\frac{\sqrt{6}}{2}$     79. 0,  $\frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{3\pi}{2}, \frac{7\pi}{4}$   
 81.  $\frac{\pi}{6}, \frac{5\pi}{6}$     83.  $\frac{25}{169}$     85.  $\frac{4}{13}$

87-97. Answers will vary.



Maximum: (3.1416, 3)

(b)  $\pi$

105. (a)



Minimum: (5.5839, -2.8642)

Maximum: (0.6993, 2.8642)

(b) 0.6993, 2.6078, 3.6754, 5.5839

107.  $2x\sqrt{1-x^2}$     109.  $1-2x^2$     111.  $\frac{1-x^2}{1+x^2}$

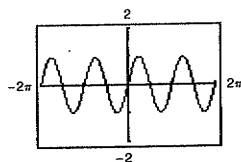
113.  $r = \frac{1}{16}v_0^2 \sin \theta \cos \theta$

115. (a)  $\theta = \pi$     (c) 760 mph; 3420 mph

(b)  $\theta = 0.4482$     (d)  $\cos \theta = 1 - \frac{2}{m^2}$

117. False.  $\sin \frac{x}{2} = -\sqrt{\frac{1-\cos x}{2}}$  for  $\pi \leq \frac{x}{2} \leq 2\pi$ .

119. (a)

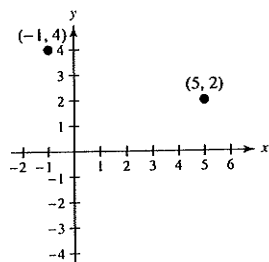


(b)  $y = \sin 2x$

(c) Answers will vary.

121. Answers will vary.

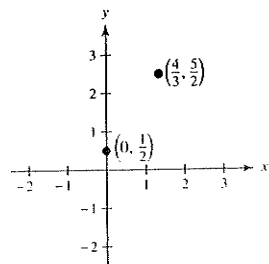
123. (a)



(b)  $2\sqrt{10}$

(c) (2, 3)

125. (a)



(b)  $\frac{2\sqrt{13}}{3}$

(c)  $(\frac{2}{3}, \frac{3}{2})$

127. (a) Complement:  $35^\circ$ ; supplement:  $125^\circ$

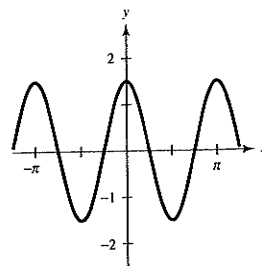
(b) Complement: none; supplement:  $18^\circ$

129. (a) Complement:  $\frac{4\pi}{9}$ ; supplement:  $\frac{17\pi}{18}$

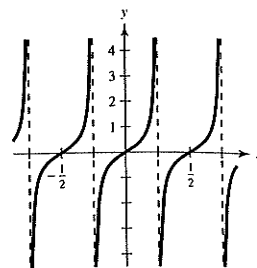
(b) Complement:  $\frac{\pi}{20}$ ; supplement:  $\frac{11\pi}{20}$

131. 0.467 rad

133.



135.



### Review Exercises (page 387)

1.  $\sec x$     3.  $\cos x$     5.  $\pm \sin x$

7.  $\sec x$     9.  $\sec x$

11.  $\tan x = \frac{4}{3}$

$\csc x = \frac{5}{4}$

$\sec x = \frac{5}{3}$

$\cot x = \frac{3}{4}$

13.  $\cos x = \frac{\sqrt{2}}{2}$

$\tan x = -1$

$\csc x = -\sqrt{2}$

$\sec x = \sqrt{2}$

$\cot x = -1$

15.  $\sin^2 x$     17.  $1 + \cot \alpha$     19. 1    21.  $\csc x$

23–35. Answers will vary.

37.  $\frac{\pi}{6} + 2n\pi, \frac{5\pi}{6} + 2n\pi$     39.  $\frac{\pi}{3} + 2n\pi, \frac{2\pi}{3} + 2n\pi$

41.  $\frac{\pi}{6} + n\pi$     43.  $\frac{\pi}{3} + n\pi, \frac{2\pi}{3} + n\pi$

45.  $\frac{\pi}{6} + n\pi, \frac{5\pi}{6} + n\pi$     47.  $n\pi$

49.  $0, \frac{2\pi}{3}, \frac{4\pi}{3}$     51.  $0, \frac{\pi}{2}, \pi$     53.  $\frac{\pi}{8}, \frac{3\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}$

55.  $0, \frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}, \frac{13\pi}{8}, \frac{15\pi}{8}$     57.  $\frac{\pi}{2}, \frac{3\pi}{2}$

59.  $0, \pi$     61. 1.2490, 1.8158, 4.3906, 4.9574

63.  $\sin 285^\circ = -\frac{\sqrt{6} + \sqrt{2}}{4}$     65.  $\sin \frac{25\pi}{12} = \frac{\sqrt{6} - \sqrt{2}}{4}$

$\cos 285^\circ = \frac{\sqrt{6} - \sqrt{2}}{4}$      $\cos \frac{25\pi}{12} = \frac{\sqrt{6} + \sqrt{2}}{4}$

$\tan 285^\circ = -2 - \sqrt{3}$      $\tan \frac{25\pi}{12} = 2 - \sqrt{3}$

67.  $\sin 190^\circ$     69.  $\tan 35^\circ$     71.  $\frac{-15 - 12\sqrt{7}}{52}$

73.  $\frac{507\sqrt{7} - 960}{1121}$

75.  $\frac{5\sqrt{7} - 36}{52}$

77-81. Answers will vary.

83.  $\frac{\pi}{6}, \frac{11\pi}{6}$

85.  $\sin 2u = \frac{20\sqrt{6}}{49}$

87.  $\sin 2u = -\frac{36}{85}$

$\cos 2u = -\frac{1}{49}$

$\cos 2u = \frac{77}{85}$

$\tan 2u = -20\sqrt{6}$

$\tan 2u = -\frac{36}{77}$

89 and 91. Answers will vary. 93.  $15^\circ, 75^\circ$ 

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

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

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

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

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

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

103.  $\sin \frac{u}{2} = \frac{\sqrt{10}}{10}$

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

$\cos \frac{u}{2} = \frac{3\sqrt{10}}{10}$

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

$\tan \frac{u}{2} = \frac{1}{3}$

105.  $\sin \frac{u}{2} = \frac{3\sqrt{14}}{14}$

$\cos \frac{u}{2} = \frac{\sqrt{70}}{14}$

$\tan \frac{u}{2} = \frac{3\sqrt{5}}{5}$

107.  $-|\cos 5x|$  109.  $V = \sin \frac{\theta}{2} \cos \frac{\theta}{2}$  cubic meters

111.  $3 \sin \frac{\pi}{2} = 3$  113.  $\frac{1}{2}(\cos \alpha - \cos 5\alpha)$

115.  $2 \cos \frac{5\theta}{2} \cos \frac{\theta}{2}$  117.  $2 \cos x \sin \frac{\pi}{4} = \sqrt{2} \cos x$

119.  $y = \frac{1}{2}\sqrt{10} \sin(8t - \arctan \frac{1}{3})$  121.  $\frac{1}{2}\sqrt{10}$

123. False.  $\cos \frac{\theta}{2} > 0$  125. True

127. Answers will vary. 129.  $y_3 = y_2 + 1$

## Chapter Test (page 390)

1.  $\sin \theta = -\frac{6\sqrt{61}}{61}$  2. 1 3. 1

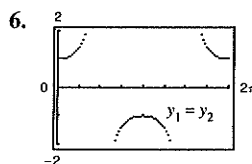
$\cos \theta = -\frac{5\sqrt{61}}{61}$

$\csc \theta = -\frac{\sqrt{61}}{6}$

$\sec \theta = -\frac{\sqrt{61}}{5}$

$\cot \theta = \frac{5}{6}$

4.  $\csc \theta \sec \theta$  5.  $\frac{\pi}{2} < \theta \leq \pi, \frac{3\pi}{2} < \theta < 2\pi$

7-12. Answers will vary. 13.  $-2 - \sqrt{3}$ 

14.  $\frac{1}{16} \left[ \frac{10 - 15 \cos 2x + 6 \cos 4x - \cos 6x}{1 + \cos 2x} \right]$

15.  $\tan 2\theta$  16.  $3(\cos 2\theta - \cos 10\theta)$

17.  $2 \cos 4\theta \cos \theta$  18.  $0, \frac{3\pi}{4}, \pi, \frac{7\pi}{4}$

19.  $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$  20.  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

21.  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$  22. 1.306

23.  $\sin 2u = \frac{4}{5}$  24.  $76.52^\circ$

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

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

## Chapter 6

## Section 6.1 (page 398)

## Vocabulary Check (page 398)

1. oblique 2.  $\frac{b}{\sin B}$

3.  $\frac{1}{2}bc \sin A; \frac{1}{2}ab \sin C; \frac{1}{2}ac \sin B$

1.  $C = 105^\circ, b \approx 16.97, c \approx 23.18$

3.  $C = 110^\circ, b \approx 22.44, c \approx 24.35$