

Appendix A: and Hints to Selected Exercises

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Chapter 1

Section 1.1 (p. § 1.1)

- 1.** 115° **3.** $A = 52^\circ$, $B = 104^\circ$ **5.** 45°
7. $A = 9^\circ$, $B = 81^\circ$ **8.** 0.011° and 89.989°
9. 25 miles **10.** 111.8 ft
15. Hint: Are the opposite sides of the four-sided figure inside the circle parallel?

Section 1.2 (p. § 1.2)

- 1.** $\sin A = 5/13$, $\cos A = 12/13$, $\tan A = 5/12$,
 $\csc A = 13/5$, $\sec A = 13/12$, $\cot A = 12/5$;
 $\sin B = 12/13$, $\cos B = 5/13$, $\tan B = 12/5$,
 $\csc B = 13/12$, $\sec B = 13/5$, $\cot B = 5/12$
- 3.** $\sin A = 7/25$, $\cos A = 24/25$, $\tan A = 7/24$,
 $\csc A = 25/7$, $\sec A = 25/24$, $\cot A = 24/7$;
 $\sin B = 24/25$, $\cos B = 7/25$, $\tan B = 24/7$,
 $\csc B = 25/24$, $\sec B = 25/7$, $\cot B = 7/24$
- 5.** $\sin A = 9/41$, $\cos A = 40/41$, $\tan A = 9/40$,
 $\csc A = 41/9$, $\sec A = 41/40$, $\cot A = 40/9$;
 $\sin B = 40/41$, $\cos B = 9/41$, $\tan B = 40/9$,
 $\csc B = 41/40$, $\sec B = 41/9$, $\cot B = 9/40$
- 7.** $\sin A = 1/\sqrt{10}$, $\cos A = 3/\sqrt{10}$, $\tan A = 1/3$,
 $\csc A = \sqrt{10}$, $\sec A = \sqrt{10}/3$, $\cot A = 3$;
 $\sin B = 3/\sqrt{10}$, $\cos B = 1/\sqrt{10}$, $\tan B = 3$,
 $\csc B = \sqrt{10}/3$, $\sec B = \sqrt{10}$, $\cot B = 1/3$
- 9.** $\sin A = 5/6$, $\cos A = \sqrt{11}/6$, $\tan A = 5/\sqrt{11}$,
 $\csc A = 6/5$, $\sec A = 6/\sqrt{11}$, $\cot A = \sqrt{11}/5$;
 $\sin B = \sqrt{11}/6$, $\cos B = 5/6$, $\tan B = \sqrt{11}/5$,
 $\csc B = 6/\sqrt{11}$, $\sec B = 6/5$, $\cot B = 5/\sqrt{11}$
- 11.** $\cos A = \sqrt{7}/4$, $\tan A = 3/\sqrt{7}$, $\csc A = 4/3$, $\sec A = 4/\sqrt{7}$, $\cot A = \sqrt{7}/3$
- 13.** $\sin A = \sqrt{6}/\sqrt{10}$, $\tan A = \sqrt{6}/2$,
 $\csc A = \sqrt{10}/\sqrt{6}$, $\sec A = \sqrt{10}/2$, $\cot A = 2/\sqrt{6}$
- 15.** $\sin A = 5/\sqrt{106}$, $\cos A = 9/\sqrt{106}$,
 $\csc A = \sqrt{106}/5$, $\sec A = \sqrt{106}/9$, $\cot A = 9/5$
- 17.** $\sin A = \sqrt{40}/7$, $\cos A = 3/7$,
 $\tan A = \sqrt{40}/3$, $\csc A = 7/\sqrt{40}$, $\cot A = 3/\sqrt{40}$
- 19.** $\cos 3^\circ$ **21.** $\sin 44^\circ$ **23.** $\csc 13^\circ$
- 25.** $\sin 77^\circ$ **27.** $\tan 80^\circ$ **30.** Hint: Draw a right triangle with an acute angle A .
- 33.** Hint: Draw two right triangles whose hypotenuses are the same length.
- 37. (a)** $\sqrt{13}/4$ **(b)** $4\sqrt{3}/\sqrt{13}$ **(c)** $3/\sqrt{13}$

Section 1.3 (p. § 1.3)

- 1.** 102.7 ft **3.** 241.1 ft **4.** 274 ft **7.** 1062 mi **9.** 0.476 in **11.** 1.955 in **13.** 0.4866 in **14.** Partial answer: $DE = a \cot \theta$
 $\cos^2 \theta$ **15.** $c = 13$, $A = 22.6^\circ$, $B = 67.4^\circ$ **17.** $a = 0.28$, $c = 2.02$, $B = 82^\circ$ **19.** $b = 6.15$, $c = 6.84$, $B = 64^\circ$
- 21.** $a = 6.15$, $c = 6.84$, $A = 64^\circ$ **23.** $a = \sqrt{2}$, $b = \sqrt{2}$, $B = 45^\circ$ **25. (a)** 0.944 cm
(b) 2.112 cm **27. (a)** $\sqrt{3}a$ **(b)** 35.26°
- 29.** 1379.5 ft = 0.2613 mi

Section 1.4 (p. § 1.4)

1. QII 3. QIV 5. negative y -axis

7. QIII 9. QIV 11. QI, QIII 13. QI, QIV 15. QI, QII 17. 43° 19. 54° 21. 85° 23. $\sin \theta = \sqrt{3}/2$ and $\tan \theta = -\sqrt{3}$;
 $\sin \theta = -\sqrt{3}/2$ and $\tan \theta = \sqrt{3}$

25. $\sin \theta = \sqrt{21}/5$ and $\tan \theta = \sqrt{21}/2$;

$\sin \theta = -\sqrt{21}/5$ and $\tan \theta = -\sqrt{21}/2$

27. $\cos \theta = \sqrt{3}/2$ and $\tan \theta = 1/\sqrt{3}$;

$\cos \theta = -\sqrt{3}/2$ and $\tan \theta = -1/\sqrt{3}$

29. $\cos \theta = \pm 1$ and $\tan \theta = 0$

31. $\cos \theta = 0$ and $\tan \theta$ is undefined

33. $\sin \theta = 1/\sqrt{5}$ and $\cos \theta = -2/\sqrt{5}$;

$\sin \theta = -1/\sqrt{5}$ and $\cos \theta = 2/\sqrt{5}$

35. $\sin \theta = 5/13$ and $\cos \theta = 12/13$;

$\sin \theta = -5/13$ and $\cos \theta = -12/13$ 37. No 39. No

Section 1.5 (p. § 1.5)

1. (a) 328° (b) 148° (c) 212° 3. (a) 248° (b) 68° (c) 292° 7. 25° , 155° 9. 65° , 295° 11. 38° , 218° 13. 169° , 191°

15. $D = \left(\frac{ab^2}{a^2+b^2}, \frac{a^2b}{a^2+b^2} \right)$

Chapter 2

Section 2.1 (p. § 2.1)

1. $b = 7.4$, $c = 15.1$, $C = 120^\circ$ 3. $a = 9.7$, $b = 10.7$, $C = 95^\circ$ 5. $b = 65.1$, $B = 136.5^\circ$, $C = 18.5^\circ$ 7. No solution 9. $b = 24.9$, $B = 59.9^\circ$, $C = 70.1^\circ$; $b = 9.9$, $B = 20.1^\circ$, $C = 109.9^\circ$ 11. 422 mi/hr 15. 5.66 cm and 12.86 cm 16. Hint: Think geometrically.

Section 2.2 (p. § 2.2)

1. $a = 10.6$, $B = 40.9^\circ$, $C = 79.1^\circ$ 3. $A = 47.9^\circ$, $b = 8.2$, $C = 72.1^\circ$ 5. No solution 7. 4.13 and 8.91 cm 9. 50.5° , 59° , 70.5°
 11. 7 cm 15. Hints: One of the angles in the formulas is a right angle; also, use the definition of cosine.

Section 2.3 (p. § 2.3)

1. $A = 79.1^\circ$, $B = 40.9^\circ$, $c = 10.6$ 3. $A = 47.9^\circ$, $b = 8.2$, $C = 72.1^\circ$ 5. No 6. Yes 11. Hint: Think of Exercise 10.

Section 2.4 (p. § 2.4)

1. 22.55 3. 9.21 5. $\frac{3}{4}\sqrt{15} \approx 2.905$

7. 12.21 9. Hints: The diagonals break the quadrilateral into four triangles; also, consider formulas (2.23)-(2.25).

Section 2.5 (p. § 2.5)

1. $R = 2.63$, $r = 0.69$ **3.** $R = 3.51$, $r = 1.36$ **5.** $R = 24.18$, $r = 1.12$ **12. (c)** Twice as large **(d)** Hint: Bisect each angle.

Chapter 3

Section 3.1 (p. § 3.1)

1. $\theta = 270^\circ$ **3.** Hint: See Example 3.7. **19.** $\tan \theta = \pm \sin \theta / \sqrt{1 - \sin^2 \theta} = \pm \sqrt{1 - \cos^2 \theta} / \cos \theta$

Section 3.2 (p. § 3.2)

3. $\sin(A + B) = \frac{1020}{1189}$, $\cos(A + B) = -\frac{611}{1189}$, $\tan(A + B) = -\frac{1020}{611}$ **4.** $(\sqrt{6} + \sqrt{2})/4$
5. $2 - \sqrt{3}$ **15.** Hint: For $a \neq 0$ and $b \neq 0$, draw a right triangle with legs of lengths a and b .

Section 3.3 (p. § 3.3)

9. Hint: Is $\sin A + \cos A$ always positive? **11.** $1/2$

Section 3.4 (p. § 3.4)

13. Hint: One way to do this is with the Law of Tangents. Another way is with the Law of Sines.

Chapter 4

Section 4.1 (p. § 4.1)

1. $\pi/45$ **3.** $13\pi/18$ **5.** $-3\pi/5$ **7.** 36° **9.** 174°

Section 4.2 (p. § 4.2)

1. 9.6 cm **3.** 11π in **5.** 54.94 in
7. 12.86 ft **8.** 34.18 **9.** 38.26
11. 3.392 and 9.174 **12.** 3.105828541

Section 4.3 (p. § 4.3)

1. 1.512 cm^2 **3.** 24.5 m^2 **5.** 269.1 cm^2 **7.** 5 cm^2 **9.** $\pi/2 \text{ cm}^2$ **11.** 0.017 cm^2 **13.** 21.46 **15.** 48.17 **17.** 0.522 m^2
19. Sector area is quadrupled, arc length is doubled.

Section 4.4 (p. § 4.4)

1. $\nu = 6$ m/sec, $\omega = 1.5$ rad/sec
3. $\nu = 6.6$ m/sec, $\omega = 0.94$ rad/sec
5. $\nu = 3.75$ m/sec, $\omega = 1.875$ rad/sec
7. 3.375 rad **9.** 32 rpm and 21.33 rpm
11. 40.84 in/sec

Chapter 5

Section 5.1 (p. § 5.1)

- 13.** Partial answer: $\sec \theta = OQ$

Section 5.2 (p. § 5.2)

- 1.** amplitude = 3, period = 2, phase shift = 0 **3.** amplitude = 1, period = $2\pi/5$, phase shift = $-3/5$ **5.** amplitude = 1, period = $2\pi/5$, phase shift = $-\pi/5$ **7.** amplitude = 1, period = π , phase shift = $3\pi/2$
- 9.** amplitude undefined, period = $\pi/2$, phase shift = $3\pi/2$ **11.** amplitude undefined, period = π , phase shift = $1/2$
- 13.** max. at $x = \pm \sqrt{\pi/2}, \pm \sqrt{5\pi/2}, \pm \sqrt{9\pi/2}, \dots$
 min. at $x = \pm \sqrt{3\pi/2}, \pm \sqrt{7\pi/2}, \pm \sqrt{11\pi/2}, \dots$
- 15.** amplitude = 0.5, period = π **17.** out of phase **18.** in phase **19.** amplitude = $\sqrt{34}$, period = 2 **21.** amplitude = $2\sqrt{2}$, period = 2π **23.** 2π **25.** 6 **27.** amplitude envelope: $y = \pm x^2$ **29.** No

Section 5.3 (p. § 5.3)

- 1.** $\pi/4$ **3.** 0 **5.** π **7.** $\pi/2$ **9.** 0
- 11.** $-\pi/3$ **13.** $\pi/7$ **15.** $4\pi/5$ **17.** $\pi/6$
- 19.** $-\pi/9$ **21.** $12/13$ **23.** $\pi/2$ **25.** $\pi/2$

Chapter 6

Section 6.1 (p. § 6.1)

- 1.** $\frac{3\pi}{4} + \pi k$ **3.** $\frac{3\pi}{10} + \frac{2\pi k}{5}$ **5.** $\pm \frac{\pi}{6} + \pi k$
- 7.** $-0.821 + 2\pi k, 3.963 + 2\pi k$ **9.** $\frac{\pi}{4} + \pi k$
- 11.** $\frac{2\pi k}{3}$

Section 6.2 (p. § 6.2)

- 1.** $x = 1.89549426703398093962$

Section 6.3 (p. § 6.3)

1. $-1 + i$ 3. $-13i$ 5. $-1 - i$ 7. i

9. $-i$ 11. i 13. $-i$ 15. i

17. Let $z = a + bi$. Then $\bar{z} = a - bi$, so $\overline{(\bar{z})} = \overline{a - bi} = a + bi = z$. 23. Hint: Use Exercise 20. 25. $\sqrt{13} \operatorname{cis} 56.3^\circ$

27. $\sqrt{2} \operatorname{cis} 315^\circ$ 29. $\operatorname{cis} 0^\circ$ 33. $81 \operatorname{cis} 56^\circ$ 35. $1.5 \operatorname{cis} 253^\circ$ 37. $\sqrt[6]{2} \operatorname{cis} 15^\circ, \sqrt[6]{2} \operatorname{cis} 135^\circ, \sqrt[6]{2} \operatorname{cis} 255^\circ$

39. $\frac{1}{2} + \frac{\sqrt{3}}{2}i, -1, \frac{1}{2} - \frac{\sqrt{3}}{2}i$ 41. $\operatorname{cis} 36^\circ, \operatorname{cis} 108^\circ, \operatorname{cis} 180^\circ, \operatorname{cis} 252^\circ, \operatorname{cis} 324^\circ$

Section 6.4 (p. § 6.4)

1. $(-3\sqrt{3}, -3)$ 3. $(\sqrt{3}, -1)$

5. $(-1/\sqrt{2}, -1/\sqrt{2})$ 7. $(\sqrt{10}, 251.6^\circ)$

9. $(2\sqrt{5}, 333.4^\circ)$ 11. $r = 6 \cos \theta$

13. $r^2 \cos 2\theta = 1$ 14. $r = 3/(2 - \cos \theta)$