

Instructor: Fred Houry

1. Find the lengths of the missing sides and angles for each triangle:
 - a) $B = 79.2^\circ$, $C = 35.1^\circ$, $a = 11.3$
 - b) $A = 120^\circ$, $a = 20$, $b = 40$
 - c) $A = 47^\circ$, $a = 80$, $b = 70$
 - d) $B = 47^\circ$, $a = 20$, $b = 18$
 - e) $A = 56^\circ$, $b = 20$, $c = 30$
 - f) $a = 20$, $b = 30$, $c = 11$
 - g) $B = 70^\circ$, $C = 10^\circ$, $a = 3$
 - h) $a = 8$, $b = 14$, $c = 15$
2. A ship sailing parallel to shore sights a lighthouse at an angle of 10° from its direction of travel. After traveling 5 miles farther, the angle is 23° . At that time, how far is the ship from the lighthouse?
3. The diagonals of a parallelogram are 26.8 meters and 39.4 meters. If they meet at an angle of 134.5° , find the length of the shorter side of the parallelogram.
4. Let $\mathbf{u} = -11\mathbf{i} + 9\mathbf{j}$, $\mathbf{v} = 9\mathbf{i} - 7\mathbf{j}$ and $\mathbf{w} = \mathbf{i} - 4\mathbf{j}$. Find the following
 - a) $4\mathbf{u} - 3\mathbf{v}$
 - b) $2\mathbf{u} - 4\mathbf{v} + 6\mathbf{w}$
 - c) $\mathbf{u} \cdot \mathbf{v}$
 - d) $\mathbf{v} \cdot \mathbf{w}$
 - e) $|\mathbf{u}|$, $|\mathbf{v}|$ and $|\mathbf{w}|$
 - f) Angle between \mathbf{u} and \mathbf{v}
 - g) Angle between \mathbf{u} and \mathbf{w}
5. Write the complex in trigonometric form
 - a) $3 - 4i$
 - b) $\sqrt{3} - i$
 - c) $2 + 2i$
 - d) $-12 + 16i$
 - e) $-5i$
 - f) -5
6. Find and leave in polar form
 - a) $(10 \text{cis} 30^\circ) \cdot (5 \text{cis} 10^\circ)$
 - b) $(5 \text{cis} 35^\circ) \cdot (2 \text{cis} 40^\circ)$
 - c) $\left(8 \text{cis} \frac{\pi}{6}\right) \cdot \left(3 \text{cis} \frac{\pi}{2}\right)$
 - d) $\frac{5 \text{cis} 200^\circ}{4 \text{cis} 50^\circ}$
 - e) $\frac{8 \text{cis} \frac{\pi}{2}}{3 \text{cis} \frac{\pi}{6}}$
 - f) $\frac{\sqrt{3} \text{cis} \frac{7\pi}{4}}{\sqrt{6} \text{cis} \frac{9\pi}{4}}$
7. Convert the polar coordinates of a point to the rectangular coordinates
 - b) $\left(7, \frac{2\pi}{3}\right)$
 - b) $\left(-9, \frac{3\pi}{4}\right)$
 - c) $(-3, -135^\circ)$
 - d) $(7, 70^\circ)$

8. Convert the rectangular coordinates of a point to the polar coordinates

a) $(-3, 3)$ b) $(-\sqrt{3}, 1)$ c) $(-2, 0.4)$ d) $(0.6, -1.1)$

9. Convert each equation from polar to rectangular coordinates

a) $r = 2$ b) $r = 2 \sin \theta$ c) $\tan \theta = 1$
d) $r = 1 + 2 \sin \theta$ e) $r = \frac{5}{1 + \cos \theta}$ f) $r = \cos \theta$
g) $r = 2(\sin \theta - \cos \theta)$ h) $r \sin \theta = 10$ i) $r(1 - 2 \cos \theta) = 1$
j) $r(\cos \theta - \sin \theta) = 3$ k) $r = \frac{4}{4 \sin \theta + 2 \cos \theta}$ l) $r - 3 \sin \theta = 3 \cos \theta$

10. Convert each equation from rectangular to polar coordinates

a) $x^2 + y^2 - 2x = 0$ b) $x + y = 2$ c) $x - y = 16$
d) $7x - y = 6$ e) $2x + 3y = 6$ f) $x^2 + y^2 = 144$

11. Find

a) $[2(\operatorname{cis} 15^\circ)]^3$ b) $\left[\sqrt{2}\left(\operatorname{cis} \frac{3\pi}{4}\right)\right]^4$ c) $\left[\sqrt{3}\left(\operatorname{cis} \frac{5\pi}{6}\right)\right]^4$
d) $(1+i)^{20}$ e) *complex fifth roots of $-2i$* f) *complex fifth roots of $\sqrt{3}+i$*

Answers

1. a) $A \approx 65.7^\circ$, $b \approx 12.2$, $c \approx 7.13$
 b) no triangle possible
 c) $B \approx 40^\circ$, $C \approx 93^\circ$, $c \approx 110$
 d) Triangle # 1: $A \approx 54^\circ$, $C \approx 79^\circ$, $c \approx 24$; triangle #2: $A \approx 126^\circ$, $C \approx 7^\circ$, $c \approx 3.0$
 e) $B \approx 41^\circ$, $C \approx 83^\circ$, $a \approx 25$
 f) $A \approx 20^\circ$, $B \approx 149^\circ$, $C \approx 11^\circ$
 g) $A \approx 100^\circ$, $b \approx 2.86$, $c \approx 0.53$
 h) $A \approx 31.8^\circ$, $B \approx 67.2^\circ$, $C \approx 81^\circ$
2. 3.86 miles
3. 14.1 meters
4. a) $-62i + 57j$ b) $-52i + 22j$ c) -162 d) 37 e) $\sqrt{202}$, $\sqrt{130}$, $\sqrt{17}$
 f) 178.58° g) 143.3°
5. a) $5 \operatorname{cis} 306.87^\circ$ b) $2 \operatorname{cis} 330^\circ$ c) $2\sqrt{2} \operatorname{cis} 45^\circ$ d) $20 \operatorname{cis} 126.9^\circ$ e) $5 \operatorname{cis} 270^\circ$ f) $5 \operatorname{cis} 180^\circ$
6. a) $50 \operatorname{cis} 40^\circ$ b) $10 \operatorname{cis} 75^\circ$ c) $24 \operatorname{cis} \frac{2\pi}{3}$ d) $\frac{5}{4} \operatorname{cis} 150^\circ$ e) $\frac{8}{3} \operatorname{cis} \frac{\pi}{3}$ f) $\frac{\sqrt{2}}{2} \operatorname{cis} \frac{3\pi}{2}$
7. a) $\left(-\frac{7}{2}, \frac{7\sqrt{3}}{2}\right)$ b) $\left(\frac{9\sqrt{2}}{2}, -\frac{9\sqrt{2}}{2}\right)$ c) $\left(\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$ d) (2.39, 6.58)
8. a) $\left(3\sqrt{2}, \frac{3\pi}{4}\right)$ b) $\left(2, \frac{5\pi}{6}\right)$ c) (2.04, 2.94) d) (1.25, -61.39°)
9. a) $x^2 + y^2 = 4$ b) $x^2 + y^2 - 2y = 0$ c) $y = x$ d) $x^2 + y^2 = \sqrt{x^2 + y^2} + 2y$
 e) $y^2 = 25 - 10x$ f) $x^2 + y^2 = x$ g) $x^2 + y^2 = 2y - 2x$ h) $y = 10$
 i) $\sqrt{x^2 + y^2} = 1 + 2x$ j) $x - y = 3$ k) $4y + 2x = 4$ l) $x^2 + y^2 - 3y = 3x$
10. a) $r = 2 \cos \theta$ b) $r = \frac{2}{\cos \theta + \sin \theta}$ c) $r = \frac{16}{\cos \theta - \sin \theta}$ d) $r = \frac{6}{7 \cos \theta - \sin \theta}$
 e) $r = \frac{6}{2 \cos \theta + 3 \sin \theta}$ f) $r = 12$
11. a) $4\sqrt{2} + i4\sqrt{2}$ b) -4 c) $-\frac{9}{2} - \frac{9\sqrt{3}}{2}i$ d) -1024
 e) $\sqrt[5]{2} \operatorname{cis} 54^\circ$, $\sqrt[5]{2} \operatorname{cis} 126^\circ$, $\sqrt[5]{2} \operatorname{cis} 198^\circ$, $\sqrt[5]{2} \operatorname{cis} 270^\circ$, $\sqrt[5]{2} \operatorname{cis} 342^\circ$
 f) $\sqrt[5]{2} \operatorname{cis} 6^\circ$, $\sqrt[5]{2} \operatorname{cis} 78^\circ$, $\sqrt[5]{2} \operatorname{cis} 150^\circ$, $\sqrt[5]{2} \operatorname{cis} 222^\circ$, $\sqrt[5]{2} \operatorname{cis} 294^\circ$