

3. (5 points) Use trigonometric identities to solve the problems below.

(a) Given $\sec \theta = \frac{29}{30}$, find the value of $\tan \theta$.

(b) Given $\cos \theta = -\frac{3}{7}$ and $\cot \theta > 0$, find $\sin \theta$.

4. (5 points) Solve the equation over the interval $[0, 2\pi)$.

$$\sec(-2x) = -\sqrt{2}$$

5. (5 points) Solve the equation over the interval $[0, 2\pi)$.

$$\cos(3x) - \cos(x) = \sin(2x)$$

6. (5 points) Solve the application problems below.

(a) An airplane climbs at an angle of 16° at an average speed of 420 miles per hour. How long will it take for the plane to reach its cruising altitude of 10 miles?

(b) Joaquin plans to build a tree house in a tree in his backyard. He takes measurements from the ground and uses trigonometry to estimate how tall the tree house can be. Twenty feet from the base of the tree, Joaquin measures a 28° angle of elevation to the proposed bottom of the tree house and a 50° angle of elevation to the proposed top of the tree house. How tall is the tree house?

7. (5 points) Solve the triangle with angle measure $\alpha = 40^\circ$, $a = 22$ cm, and $b = 25$ cm.

8. (5 points) Draw a triangle on the cartesian plane such that one vertex is at the origin, another is at the point $(c, 0)$, and another at (x, y) . Label the interior angle near the origin as α . Use the fact that distance from $(c, 0)$ to (x, y) is the length of side a to derive the law of cosines.

9. (5 points) Consider the polar equation $r = 9 \sin \theta$. Convert it to a rectangular equation and identify the graph.

10. (5 points) Test the polar equation $r = 1 + 4 \cos \theta$ for symmetry. Then graph it by plotting points.

11. (5 points) Find the fourth roots of $-32i$. Plot them on the complex plane.

12. (5 points) Decompose the vectors $\mathbf{v} = \langle 7, -3 \rangle$ and $\mathbf{w} = \langle -2, -6 \rangle$ into two orthogonal vectors. Check that the vectors you find are orthogonal.

13. (5 points) Complete parts (a) and (b) below.

(a) Eliminate the parameter and write an equation in rectangular coordinates to represent the ellipse: $x = h + a \cos \theta$ and $y = k + b \sin \theta$.

(b) Use the parameter t to write parametric equations representing the ellipse with center $(-2, 1)$, vertices $(1, 1)$ and $(-5, 1)$, and endpoints of the minor axis $(-2, 3)$ and $(-2, -1)$.