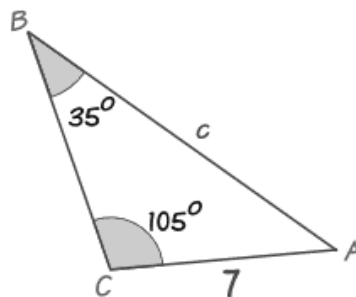


Please do your work in a well-organized manner. **Credit is based on the amount of correct work shown, not just on the final answer.** Use proper notation. Only *scientific calculators* are allowed on the exam.

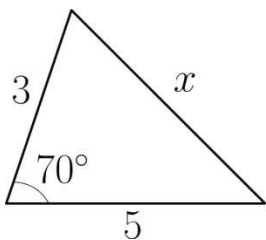
Some helpful formulas are located on the last page!

The following problems refer to a triangle ABC which has angles and/or sides as given. Solve for the indicated side or angle.

1. (8 pts) Solve for side c , as shown, in the triangle.



2. (12 pts) Given the triangle as shown,
(a) Solve for side x .



- (b) Find the other two angles in the triangle.

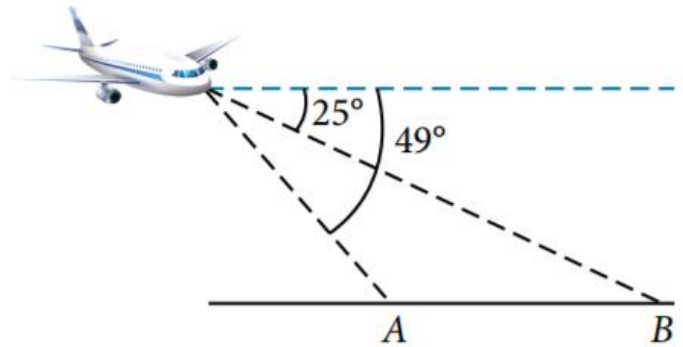
3. (4 pts) (a) Use the Law of Sines to show that no triangle exists for which $A = 60^\circ$, $a = 1$ in, and $b = 3$ in.

(b) Extra Credit (2 points) Make a somewhat accurate sketch of the given sides and angle to illustrate why Triangle ABC doesn't exist.

Sketch:

4. (8 pts) A pilot is flying over a straight highway. She determines the angles of depression to two points, A and B, to be 25° and 49° , as shown in the picture. The distance between A and B is 1.6 miles.

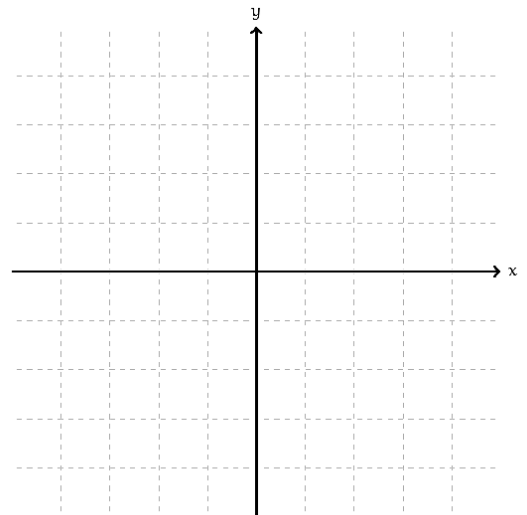
(a) Find the distance from the plane to point A. Round your answer to the nearest tenth of a mile.



(b) Find the elevation of the plane (height directly above the ground).

5. (6 pts) (a) Plot the Cartesian point $(4, -4)$

(b) What is r for the polar coordinates of this point? Show work and leave in exact form.



(c) What is θ ? $0 \leq \theta \leq 2\pi$ _____

(d) Write the point in Polar Coordinates: _____

6. (10 pts) (a) Plot and label (A,B,C) the polar points.

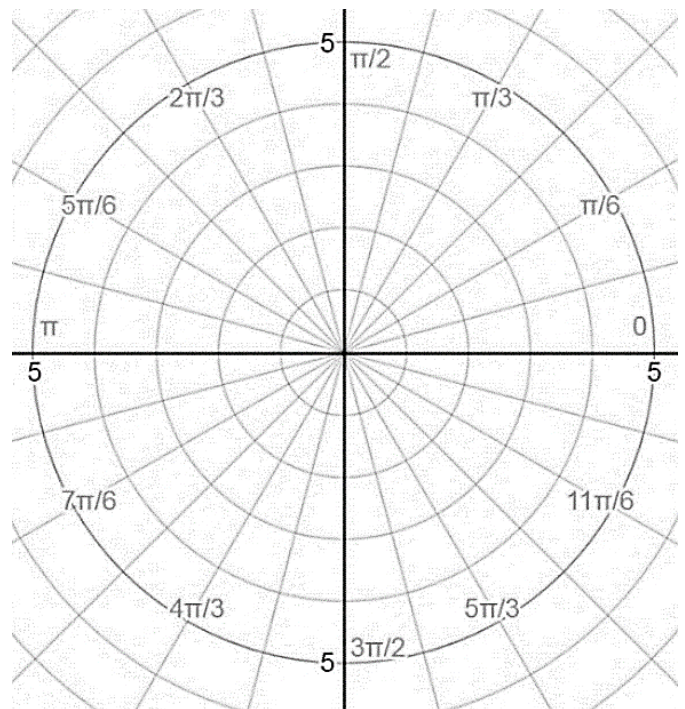
Point A: $(4, \frac{5\pi}{6})$

Point B: $(-3, \pi)$

Point C: $(6, -\frac{\pi}{4})$

(b) Convert Point A $(4, \frac{5\pi}{6})$ to Cartesian Coordinates.

Show work and leave in exact form.



7. (6 pts) Convert each rectangular equation to a polar equation. Solve for r in each case.

(a) $x^2 + y^2 = 4$

(b) $y = 7$

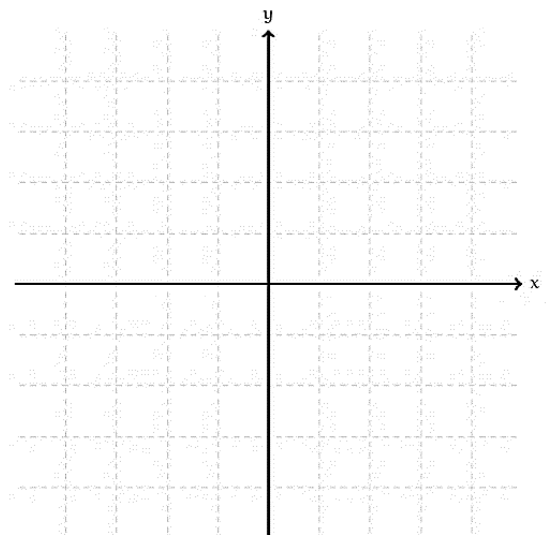
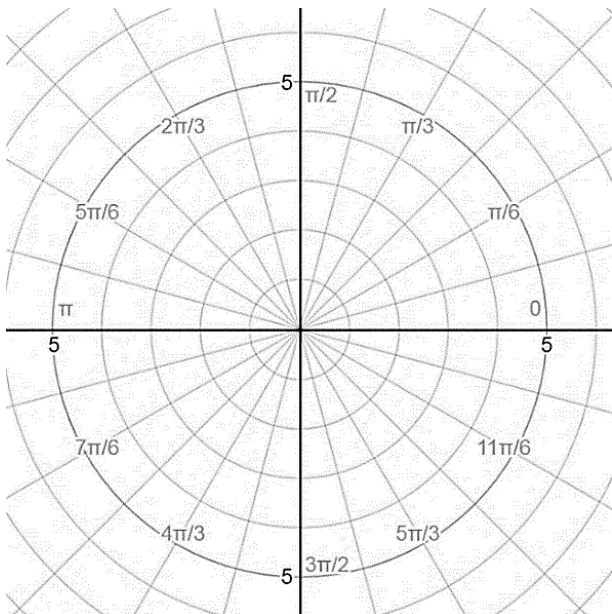
8. (6 pts) Convert each polar equation to a rectangular equation.

(a) $r = 6 \sin \theta$

(b) $r = \frac{4}{\cos \theta}$

9. (4 pts) Graph the polar equation $r = 3$ on both coordinate grids.

No work is necessary and you do not need to convert to rectangular coordinates!

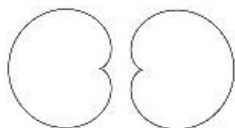


10. (8 pts) Graph the polar equation $r = 3 - 3\cos\theta$.

For full credit, you must include a table with 8 points, using $\frac{\pi}{4}$ as your increment.

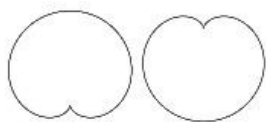
For reference:

Horizontal
Cardioids



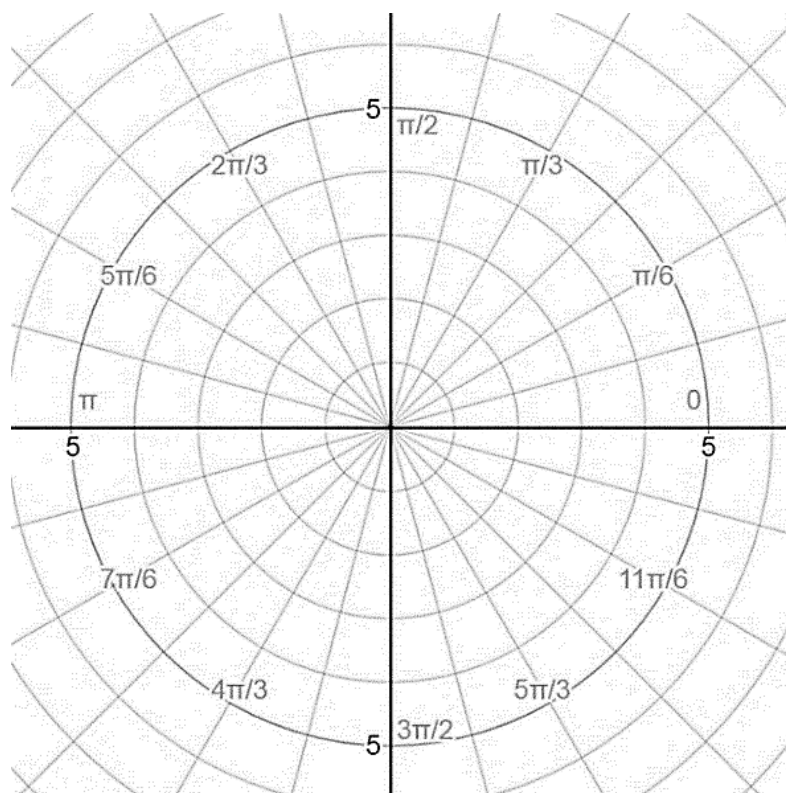
$$r = a \pm a\cos\theta$$

Vertical
Cardioids



$$r = a \pm a\sin\theta$$

Table:

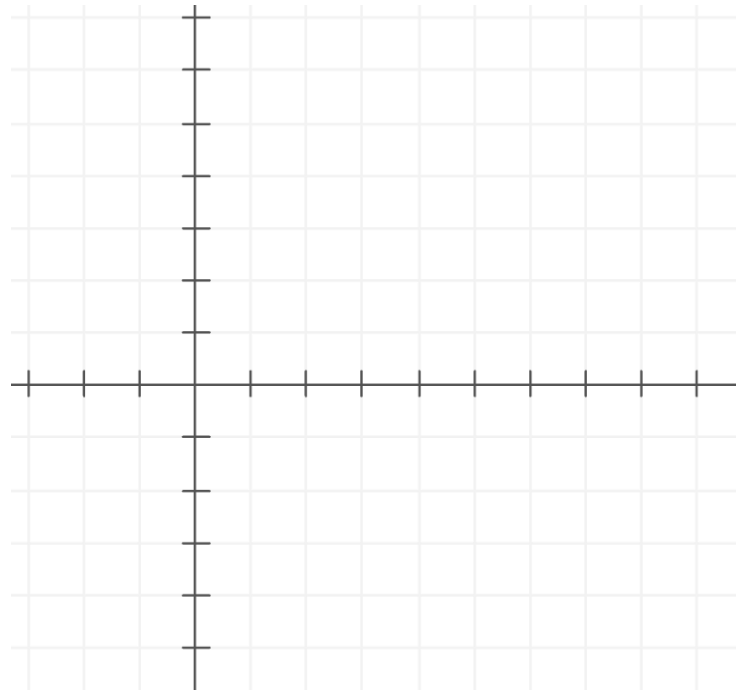


11. (12 pts) For vector $\vec{v} = 4\hat{i} + 3\hat{j} = \langle 4, 3 \rangle$

(a) Graph \vec{v} and $2\vec{v}$

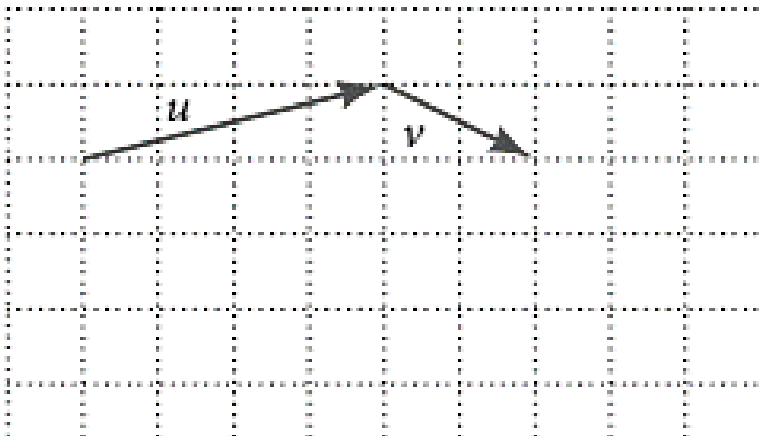
(b) Find the magnitude of \vec{v} . Show work!

(c) Find the direction of \vec{v} in degrees (standard angle).
Round the angle to one decimal place.



(d) Find a unit vector, \vec{u} , in the same direction as \vec{v} . Illustrate \vec{u} on the graph of \vec{v}

12. (6 pts) Graph $\vec{u} + \vec{v}$, $\vec{u} - \vec{v}$, and $\vec{u} + 2\vec{v}$ on the given grid. Label each!



13. (6 pts) Use the vectors $\vec{v} = \langle 3, -2 \rangle$ and $\vec{w} = \langle 1, 5 \rangle$ to find each of the following:

(a) $-5\vec{v} + 6\vec{w}$

(b) $\vec{v} \cdot \vec{w}$

14. (4 pts) Suppose Bella throws a baseball with an initial velocity of 55 feet per second at an angle of 42° . Find the horizontal and vertical components of the velocity vector of the ball. Round to one decimal place.

Extra credit (3 pts):

Carlos is backpacking in the Sierras. From his starting point, he hiked 4 miles in the southwest direction. He then turned and hiked 2 miles due north. If he wants to hike directly back to his starting point, in what direction will he have to walk? Include a detailed sketch with the solution.

Helpful formulas:	$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$	$c^2 = a^2 + b^2 - 2ab \cos(C)$
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