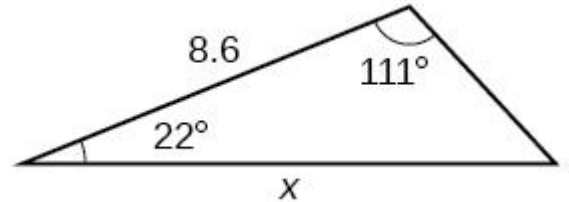


Please do your work in a well-organized manner. Credit is based on the amount of correct work shown, not just on the final answer. Use proper notation. Only *scientific calculators* are allowed on the exam.

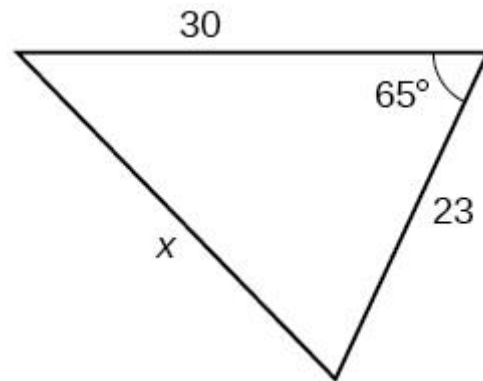
*Some helpful formulas are located on the last page!*

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  $x$ , as shown, in the triangle.



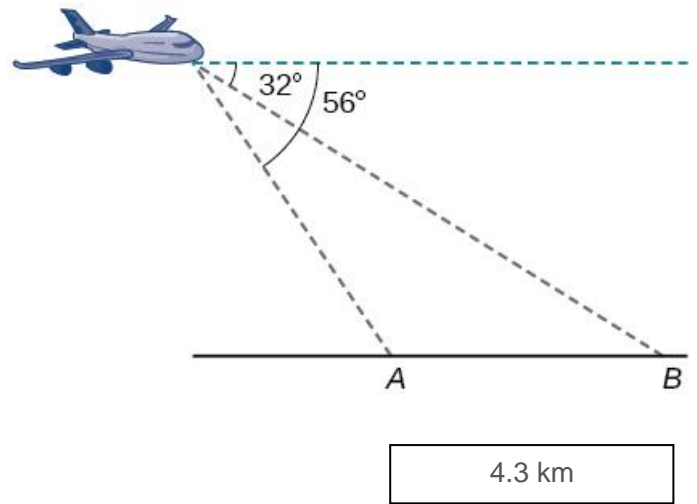
2. (14 pts) Given the triangle as shown,  
(a) Solve for side  $x$ .



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

3. (8 pts) A pilot is flying over a straight highway. She determines the angles of depression to two mileposts, 4.3 km apart, to be  $32^\circ$  and  $56^\circ$ , as shown in the picture.

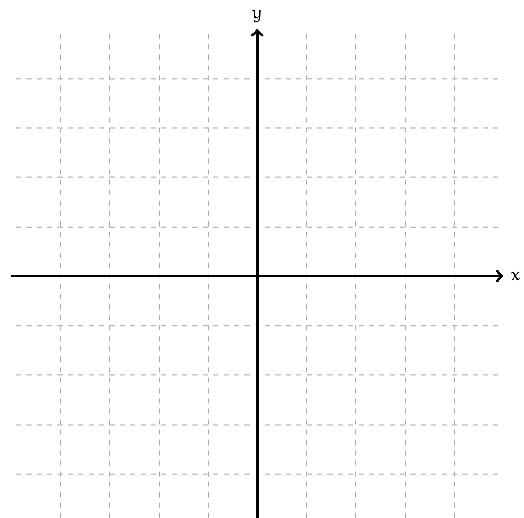
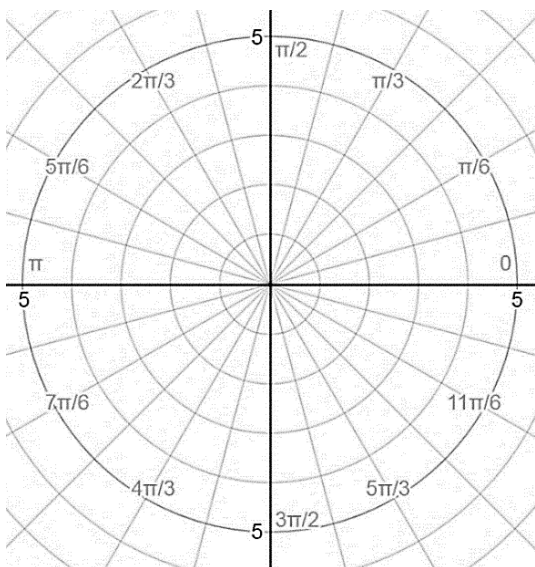
(a) Find the distance from the plane to point A. Round your answer to the nearest tenth of a kilometer.



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

4. (6 pts) Plot the polar points. You may either use the polar grid provided or plot them on the xy-coordinate system,,your choice!. LABEL the points.

Point A:  $(3, \frac{\pi}{3})$  Point B:  $(-2, \frac{\pi}{2})$  Point C:  $(4, -\frac{\pi}{6})$



5. (6 pts) Convert the point  $\left(5, \frac{-2\pi}{3}\right)$  to rectangular form. Show work for credit!

6. (6 pts) Convert the rectangular number  $(-3, -3)$  to polar form. Show work for credit!

7. (6 pts) Convert the rectangular equation to a polar equation. Simplify the answer as much as possible.

$$x^2 + y^2 = 4x$$

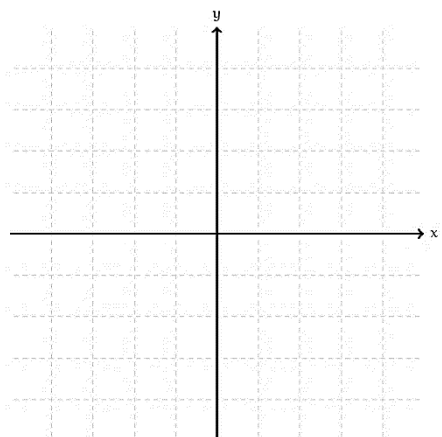
8. (8 pts) Convert the polar equation to a rectangular equation. (Hint on (b): Clear the fraction!!!)

(a)  $r = 7 \cos \theta$

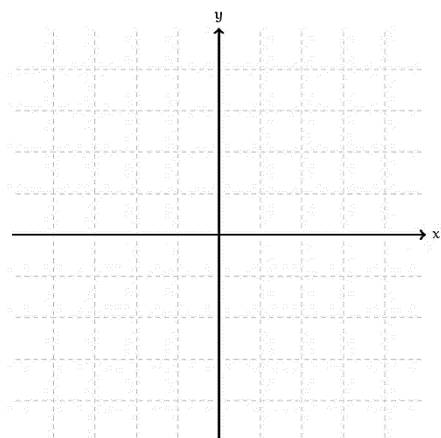
(b)  $r = \frac{-2}{4 \cos \theta + \sin \theta}$

9. (6 pts) Graph each of the polar equations. No work is necessary and you do not need to convert to rectangular coordinates!

(a)  $\theta = \frac{\pi}{6}$

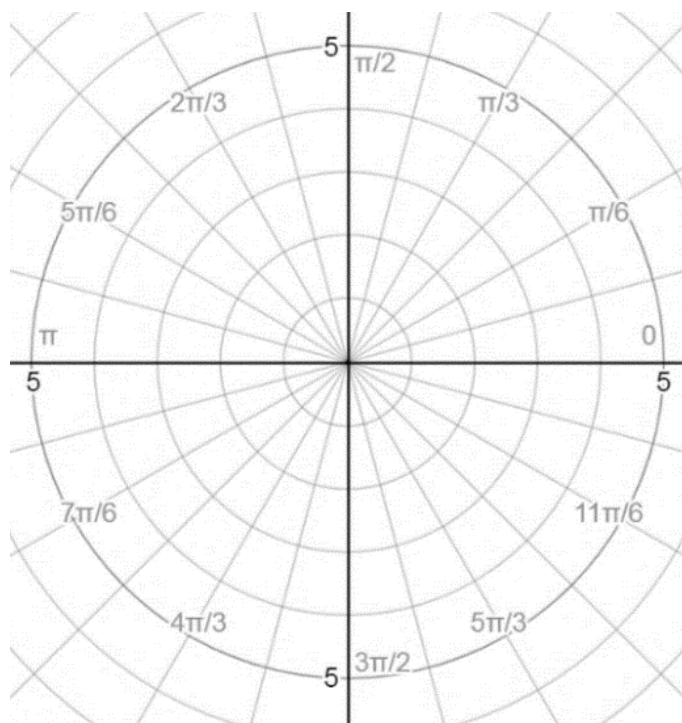


(b)  $r = 3$



10. (12 pts) Graph the polar equation  $r = 2 - 2 \cos \theta$ . For full credit, you must include a table with 8 points, using  $\frac{\pi}{4}$  as your increment.

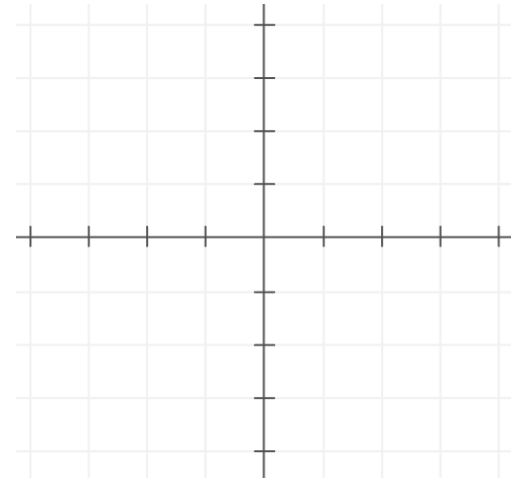
Table:



11. (8 pts) Given the complex number  $z = -2 + 3i$

(a) Graph  $z$  on the Complex Plane.

(b) Find the absolute value of  $z$ . Leave in exact terms.



$|z| = \underline{\hspace{2cm}}$

12. (6 pts) Convert the complex number from polar to rectangular form. Show work for credit!

Round your answer to one decimal place.

$$z = 3cis(40^\circ),$$

13. (6 pts) Write the complex number  $z = 1 + \sqrt{3}i$  in polar form. Show work for credit and express your answer in exact terms.

**Helpful formulas:**

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

$$c^2 = a^2 + b^2 - 2ab \cos(C)$$

$$|z| = \sqrt{a^2 + b^2}$$

$$z = a + bi = |z|cis\theta, \quad \tan \theta = \frac{b}{a}$$