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**Read Me First:** Show all essential work neatly. Use correct notation when presenting your computations. Write using complete sentences. In particular, be very careful when using "=", **equals**, and " $\Rightarrow$ ", **implies**. Do not "box" your answers. Communicate.

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1. (10 pts.) (a) Obtain all solutions to the equation below, and then (b) list the solutions  $\theta$  with  $0 \leq \theta < 2\pi$ .

$$\sin(2\theta) = -1$$

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2. (5 pts.) Write the equation of a cosine function that has all the given characteristics:

Amplitude = 6

Period = 2

Phase Shift:  $-(1/2)$

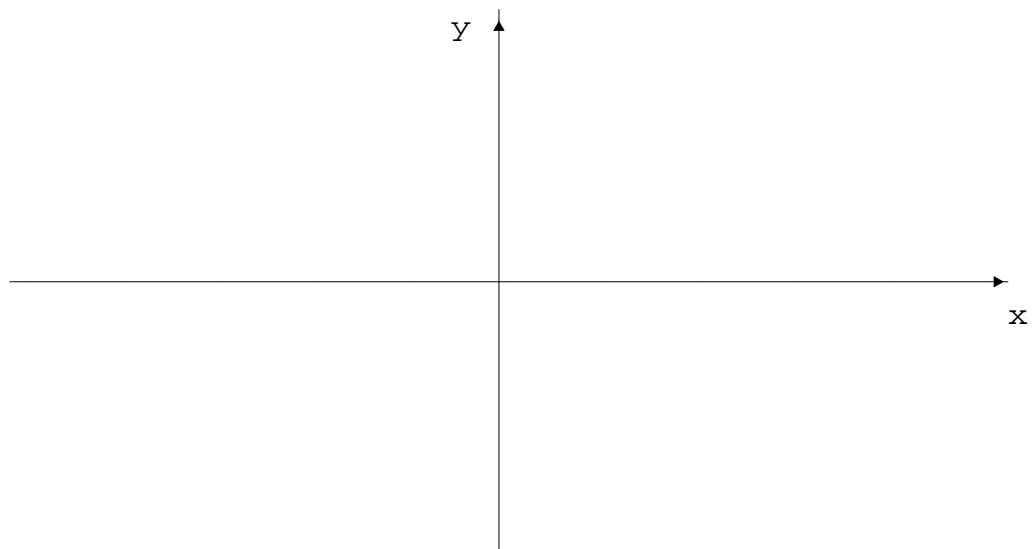
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3. (10 pts.) Carefully sketch  $y = 2 \cdot \sin(2\pi x - (\pi/2))$  through at least one period. You will need the amplitude, period, and phase shift to do this.

Amplitude =

Period =

Phase Shift =



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4. (10 pts.) (a) Obtain all solutions to the equation below, and then (b) list the solutions  $\theta$  with  $0 \leq \theta < 2\pi$ .

$$2 \cdot \sin^2(\theta) - 3 \cdot \sin(\theta) + 1 = 0$$

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5. (10 pts.) A right triangle has one angle of  $35^\circ$  and one leg of length 100 meters. What are the two possible lengths for the hypotenuse?? [You may want to sketch the two situations.]

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6. (5 pts.) A triangle has two sides with lengths 5 feet and 8 feet. If the two sides meet in an angle of  $60^\circ$ , what is the exact length of the third side??

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7. (5 pts.) If the polar coordinates of a point are given by  $(r, \theta) = (7.5, 110^\circ)$ , find the rectangular coordinates for the point. In doing this, make clear which values are exact and which are approximations.

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8. (5 pts.) If the rectangular coordinates of a point are given by  $(x, y) = (-2, -2\sqrt{3})$ , obtain polar coordinates for the point.

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9. (5 pts.) Suppose that the letters  $x$  and  $y$  represent rectangular coordinates. Write the following rectangular equation in terms of polar coordinates  $(r, \theta)$ .

$$y^2 = 2x$$

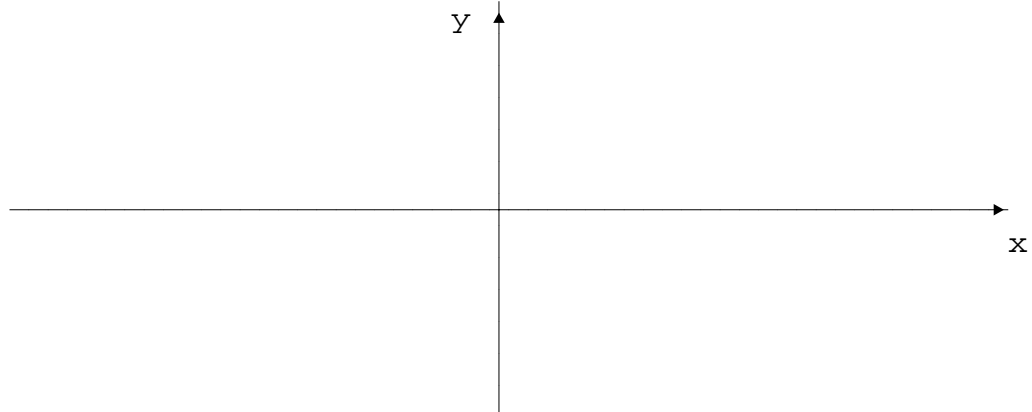
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10. (5 pts.) Suppose that the letters  $r$  and  $\theta$  represent polar coordinates. Write the following polar equation in terms of rectangular coordinates  $(x, y)$ . Can you identify the object??

$$r = 6 \cdot \sin(\theta) - 8 \cdot \cos(\theta)$$

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11. (5 pts.) Plot the following polar points below. Label carefully:  $A = (2, 45^\circ)$ ,  $B = (-2, 45^\circ)$ ,  $C = (2, -30^\circ)$ ,  $D = (-2, -30^\circ)$



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12. (10 pts.) To measure the height of the top of a distant object, a surveyor takes two sightings of the top of the object 1000 feet apart. The first sighting, which is nearest the object, results in an angle of elevation of  $50^\circ$ . The second sighting, which is most distant from the object, results in an angle of elevation of  $35^\circ$ . If the transit used to make the sightings is 5 feet tall, what is the height of the object. [Hint: Make a diagram of the situation. The distance from the base of the object is unknown. You may assume the object is on a level plane with the base of the transit.]

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13. (10 pts.) Use the Law of Sines to solve the triangle with  $\alpha = 110^\circ$ ,  $\gamma = 30^\circ$ , and  $c = 3$ . You may assume that the standard labelling scheme is used.

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14. (5 pts.) Determine whether one, two, or no triangles result from the following data. You do not have to solve the triangles that might result. You may assume that the standard labelling scheme is used.

$$a = 3, b = 7, \alpha = 70^\circ$$