

MTH 113 Final Exam (practice)

1. (X pts.) Convert the following angles (1 of each problem):

**$50^\circ$**  from degrees to radians (leave  $\pi$  in your answer if applicable)

**$-\frac{5\pi}{3}$**  from radians to degrees

2. (X pts.) Find the reference angle  $\theta'$  for each of the following angles (2 problems)

**$\theta = 240^\circ$**

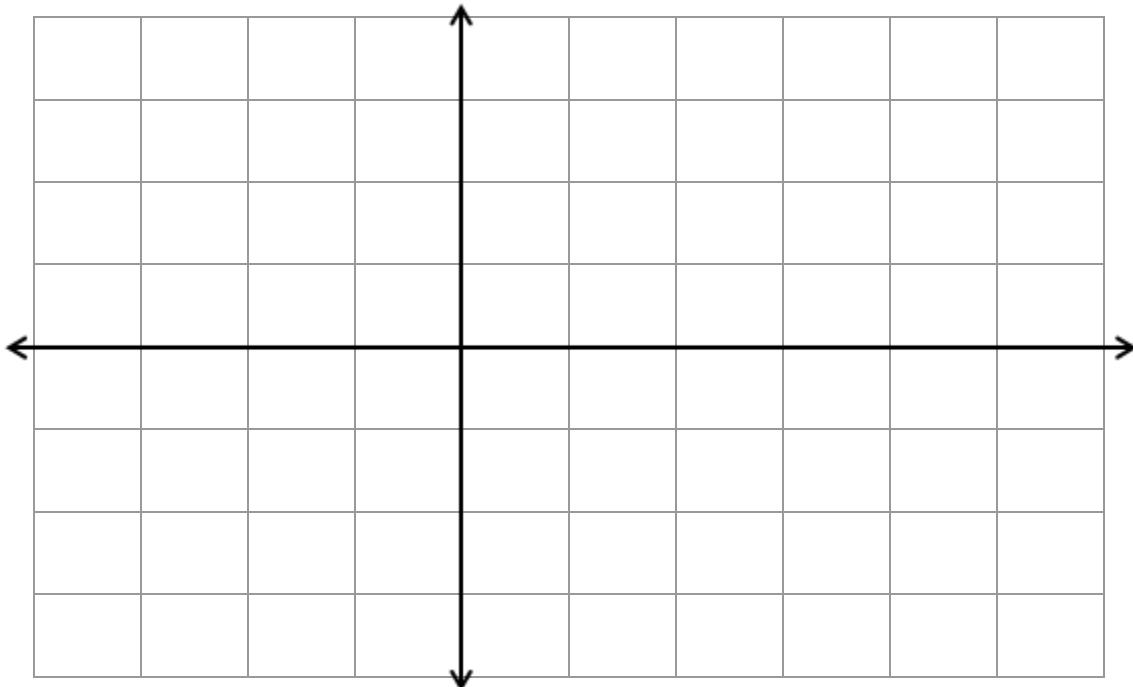
**$\theta = 5\pi/6$**

3. (X pts.) Find the exact value of the following functions (leave in any radical signs and simplify answer) (2)

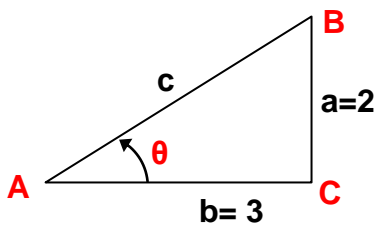
**$\cos\left(\frac{\pi}{4}\right)$**

**$\sin(210^\circ)$**

4. (X pts.) Sketch the graph of  **$y = \sin(2x) - 1$**  over the interval  **$-\frac{\pi}{2} \leq x \leq \pi$**  (1)



5. (X pts.) Find the following for the given right triangle (simplify answer) (2)



$$\sin \theta =$$

$$\cos \theta =$$

$$\tan \theta =$$

6. (X pts.) The flagpole in the middle of Sesame Street is 12 meters tall and casts a shadow 8 meters long. Sketch the problem and find the angle of elevation of the sun to the nearest tenth of a degree. (1)

7. (X pts.) Verify the following trigonometric identities... (3)

$$\sin x - \sin x \cos^2 x = \sin^3 x$$

$$\cot(\theta) \cos(\theta) + \sin(\theta) = \csc(\theta)$$

$$\frac{\cos(\alpha - \beta)}{\cos \alpha \cos \beta} = 1 + \tan(\alpha) \tan(\beta)$$

$$\tan \theta = \frac{\sin 2\theta}{1 + \cos 2\theta}$$

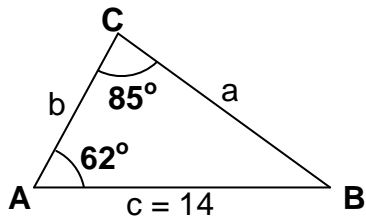
8. (X pts.) Solve each equation on the interval  $[0, 2\pi)$  (2)

$$\tan 2x = \sqrt{3}$$

$$4 \cos^2 x - 3 = 0$$

9. (X pts.) Solve the following oblique triangles (round to nearest tenth)... (1/4)

SAA and/or ASA case (Law Of Sines)...



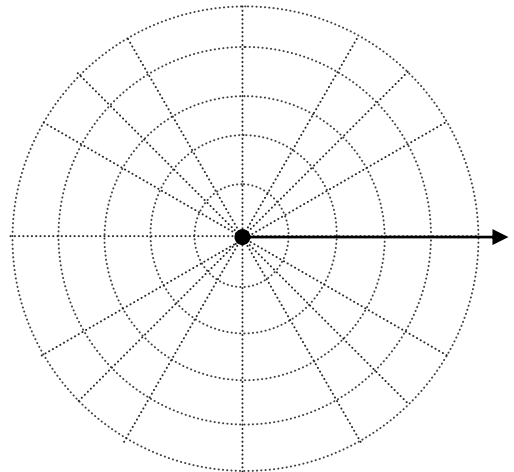
10. (X pts.) Due to a mistake in flight plans, two airplanes (one with the players, the other with the equipment) leave Tuscaloosa headed for Alablehma's bowl game at the exact same time. One flies a straight path on a bearing of **S35°E** (towards the Outback Bowl) at **280 miles per hour**. The other plane flies a straight path on a bearing of **S82°W** (towards the Cotton Bowl) at **285 miles per hour**. How far apart will the airplanes be after 2 hours? (1)

11. (X pts.) Plot and label the following polar coordinates  $(r, \theta)$ ...(2)

A:  $(4, \frac{2\pi}{3})$

B:  $(-3, \frac{\pi}{6})$

C:  $(5, \frac{-7\pi}{3})$



12. (X pts.) Find the rectangular coordinates of the point whose polar coordinates are  $(3, \frac{5\pi}{6})$  (1)

13. (X pts.) If  $\mathbf{v} = 3\mathbf{i} + 2\mathbf{j}$  and  $\mathbf{w} = 5\mathbf{i} - 3\mathbf{j}$ , find each of the following vectors... (3)

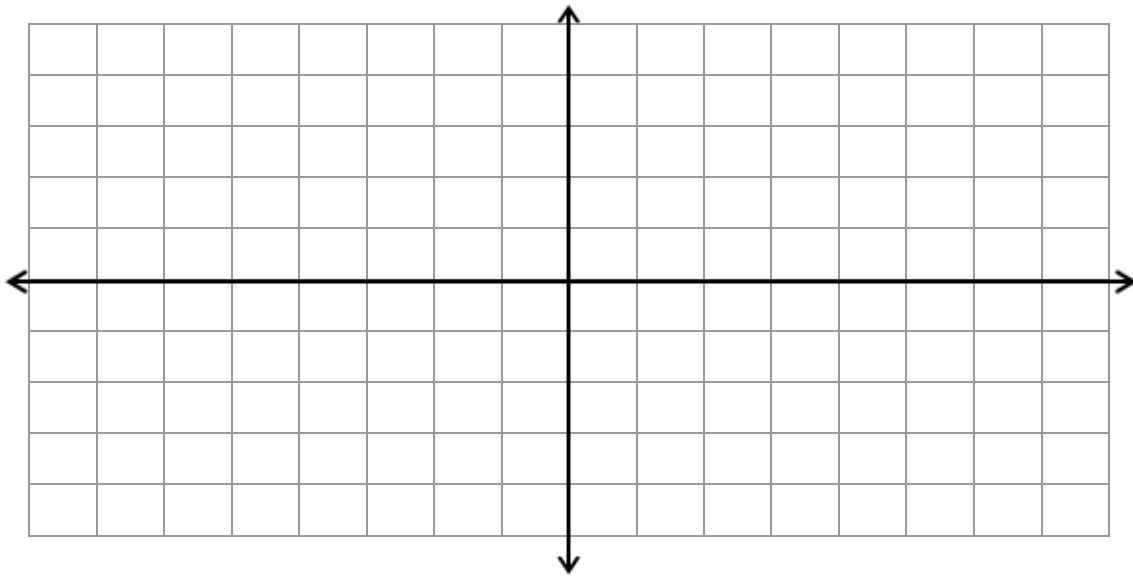
$\mathbf{v} - \mathbf{w}$

$3\mathbf{v} + 4\mathbf{w}$

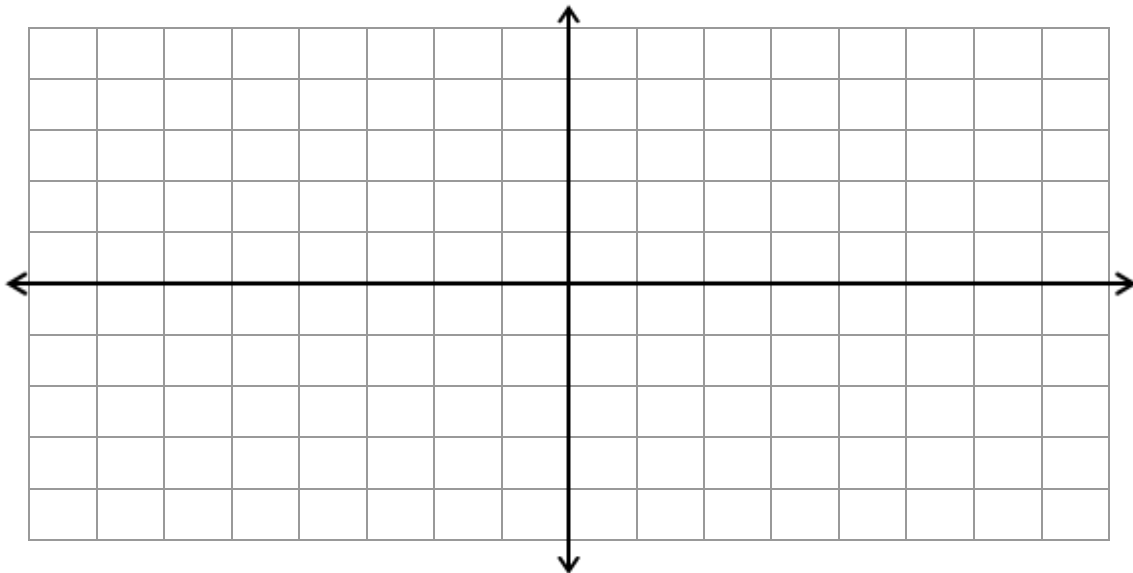
$\mathbf{v} \cdot \mathbf{w}$

14. (X pts.) The jet stream is blowing at **60 miles per hour** in the direction of **N 45° E**. Express its velocity as a vector (1)

15. (X pts.) Sketch the graph of  $\frac{(x-2)^2}{25} - \frac{(y+1)^2}{9} = 1$  (1)



16. (X pts.) Find focus and directrix of the parabola given and graph  $x^2 = 12(y + 2)$  (1)



Focus =>

Directrix =>

17. (X pts.) Find the standard form of an ellipse with foci at  $(0, -6)$  and  $(0, 6)$  and vertices  $(0, -10)$  and  $(0, 10)$  (1)
- Or multiple choice – choose the correct graph / choose the correct equation -
18. (X pts.) Convert the equation into standard form  $4x^2 + y^2 - 8x + 4y - 8 = 0$  (1 complete the square)
19. (X pts.) Identify the type of graph given by  $3x^2 + 2y^2 + 12x - 4y + 2 = 0$  (1)
20. (X pts.) Cookie Monster is making an effort to go green, so he has decided to make a solar cooker to help him bake cookies (satellite dish basically) with a diameter of 6 feet and a depth of 1 foot. Where should he put the cooker (focus) to get the maximum reflected sun rays to bake the cookies? (1)
21. (X pts.) A trigonometry book is launched by an angry student with an initial velocity of 200 ft. per second at an angle of  $42^\circ$  with the horizontal. The book was launched from a height of 4 feet. (2)
- a) Find the parametric equations that describe the position of the book as a function of time. (1)
- b) Describe the book's position after  $t = 1$  second and after  $t = 3$  seconds (1)

BONUS QUESTIONS ???