

No Calculators or Computing Devices. Use Algebraic Notation AND Show All of Your Work. No Assistance or Collaboration!

1. (5 points) Verify the identity: $\frac{\sin(x + y) + \sin(x - y)}{\cos(x + y) + \cos(x - y)} = \tan(x)$

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

$$2\sqrt{3}\cos(\theta) + 3 = 0$$

2. _____

3. (5 points) Verify the identity: $\frac{\sin(3x) + \cos(3x)}{\cos(x) - \sin(x)} = 1 + 2 \sin(2x)$

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

$$2 \cos^2(\theta) = \cos(\theta) + 1$$

4. _____

5. (4 points) Find the exact value of $\cos\left(\frac{7\pi}{12}\right)$

5. _____

6. (5 points) Find the exact value of the expression $\tan\left(2\cos^{-1}\left(\frac{3}{7}\right)\right)$

6. _____

7. (3 points) Convert the polar point $(r, \theta) = \left(-\sqrt{3}, \frac{2\pi}{3}\right)$ to its equivalent rectangular coordinate.

7. _____

8. (5 points) Consider the complex number $1 + i\sqrt{3}$. **(a)** Graph the complex number in the complex plane. **(b)** Find the modulus and the argument. **(c)** Write the number in polar form. 8. _____

9. (5 points) Use DeMoivre's Theorem to find $(4 - 4i)^5$

9. _____

10. (5 points) Find the square roots of $4 - 4i$

10. _____

11. (5 points) Find the length and direction of the vector $\vec{u} = \langle -3, -3 \rangle$

11. _____

12. (4 points) Consider the parametric curves:

$$x = 1 - t^2, \quad y = 1 + t$$

(a) Sketch the curve represented by the parametric equations. (b) Find a rectangular coordinate equation for the curve by eliminating the parameter.

12. _____

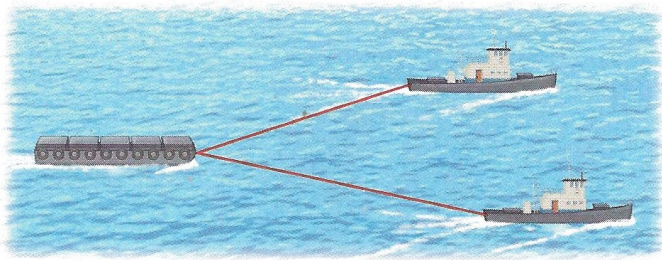
13. (5 points) Suppose the vector \vec{u} has length $|\vec{u}| = 20$ and direction $\theta = 60^\circ$ are given. Express \vec{u} in component form.

13. _____

Calculator Section

Name: _____

14. (6 points) Two tugboats are pulling a barge as shown in the figure.



One pulls with a force of 2.0×10^4 lb. in the direction N 50° E, and the other pulls with a force of 3.4×10^4 lb. in the direction S 75° E.

- a.) Find the resultant force on the barge as a vector.
- b.) Find the magnitude and direction of the resultant force.

14. _____