CAMOSUN

Name: ____________________

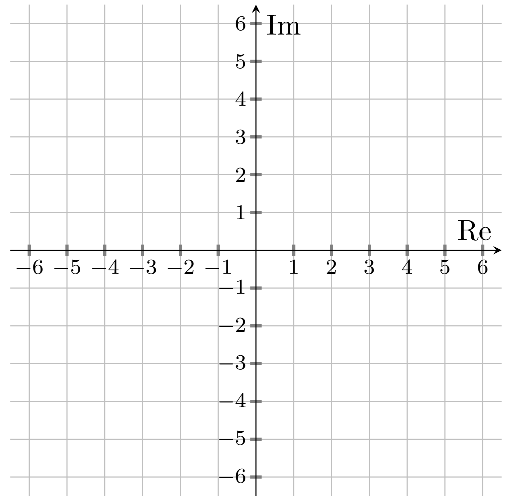
Mark: $\overline{}$ **25**

MATH 251
Assignment 5

1. (1 mark) Write $-3i$ in phasor form using degrees and then evaluate the product $(-3i)(5\underline{/25^\circ})$. Express your answer in phasor form.

2. (3 marks) Evaluate $(1 - i\sqrt{3})^{14}$. Express your answer in both Euler and rectangular form, using exact values in both cases.

3. (4 marks) Find all the cube roots of $44+117i$. Express each root in the rectangular form $a+bi$ with a and b rounded to three decimal places. Plot each of the roots in the complex plane.



4. (2 marks) Suppose $z_1 = a_1 + b_1 i$ and $z_2 = a_2 + b_2 i$. Express the quotient $z = z_1/z_2$ in the form $a + bi$.

5. (2 marks) Show that $\mathbf{v} = \begin{bmatrix} -3 \\ 0 \\ 1 \end{bmatrix}$ is an eigenvector of $A = \begin{bmatrix} 4 & -1 & 6 \\ 2 & 1 & 6 \\ 2 & -1 & 8 \end{bmatrix}$ and find the corresponding eigenvalue.

6. (4 marks) Suppose $\lambda_1 = 3$ is an eigenvalue of $A = \begin{bmatrix} 4 & 5 \\ -2 & k \end{bmatrix}$.

   (a) Find k.

   (b) Find the other eigenvalue, λ_2.

   (c) Find one eigenvector associated with each eigenvalue λ_1 and λ_2.

7. (3 marks) Use Cramer's Rule to solve the following system.

$$\begin{cases} x_1 - 3x_2 + x_3 = 4 \\ 2x_1 - x_2 = -2 \\ 4x_1 - 3x_3 = 0 \end{cases}$$

8. (4 marks) Consider the matrix

$$A = \begin{bmatrix} 1 & 0 & \tan\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}.$$

(a) Find and simplify $\det(A)$.

(b) Use the cofactor method to find A^{-1}.

9. (2 marks) Use determinants to find the volume of the parallelepiped formed by the vectors

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}, \quad \mathbf{v}_2 = \begin{bmatrix} 5 \\ 1 \\ -7 \end{bmatrix}, \quad \mathbf{v}_3 = \begin{bmatrix} 1 \\ -6 \\ 0 \end{bmatrix}.$$