# 🏛 BRAC University

Department of Mathematics and Natural Sciences

## Total Points: 15

## 📋 Assignment-01

### Course Code: MAT215

Complex

👤 **Name: SUPORNO GHOSH**

🪪 **Student ID: 24301509**

👥 **Section: 12**

📅 **Semester: FALL 2025**

🕐 Submission Date: _____

*Assigned by*

👤 **Partho Sutra Dhor**

Lecturer, Department of MNS
BRAC University

## ❓ Question 1

Find all possible values of $z$ such that

$$z^6 = 32\sqrt{3} - 32i$$

Locate them in the complex plane. Show that they are contained in a circle and find the radius of that circle. Also find the angular distance between two adjacent roots.

✏️ **Solution:**

## ❷ Question 2

Consider the equation

$$|z + 7i| + |z - 7i| = 19$$

Describe the above locus in the complex plane.

✒ **Solution:**

## ❓ Question 3

Consider the inequality

$$|z + 6| + |z - 6| < 13$$

Describe the above locus in the complex plane.

✏️ **Solution:**

## ❓ Question 4

Solve the following equation for $z$:

$$e^{4z} = \frac{7\sqrt{3}}{2} + \frac{7i}{2}$$

Express $z$ as $x + iy$ where $x, y, \in \mathbb{R}$.

✏️ **Solution:**

## ❓ **Question 5**

Prove that

$$\sinh^{-1} z = \ln\left(z + \sqrt{z^2 + 1}\right),$$

✏️ **Solution:**

❓ **Question 6**

Solve for $z$:

$$\operatorname{cosech}^{-1} z = 2 + 2i$$

✏ **Solution:**

❓ **Question 7**

Solve

✏️ **Solution:**

## ❓ Question 8

Solve

✒️ **Solution:**

## ❓ Question 9

Solve

### ✒ Solution:

## ❓ Question 10

Using the definition show that

$$f(z) = 7z^2 + 5z - 8$$

is differentiable at all points. Also find the derivative.

✏️ **Solution:**

## ❓ Question 11

Using the definition, find the derivative of

$$f(z) = \frac{7}{5z + 3} \quad \text{at} \quad z = z_0$$

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✏ **Solution:**

## ❓ Question 12

@Q12@

✏️ Solution:

## ❓ Question 13

@Q13@

✒ Solution:

## ❓ Question 14

Show that the given function $u$ defined by

$$u(x, y) = 8e^{-6x} \cos(6y) - 5e^{9y} \sin(9x) + 15x^2 y - 5x^2 - 5y^3 + 5y^2$$

is harmonic. Find the harmonic conjugate $v$ of $u$ such that $\mathbf{u+vi}$ becomes analytic.

✏ **Solution:**

## ❓ Question 15

Show that the given function $v$ defined by

$$v(x, y) = 2xe^{-7x} \cos{(7y)} + 2ye^{-7x} \sin{(7y)}$$

is harmonic. Find the harmonic conjugate $u$ of $v$ such that $\mathbf{u+vi}$ becomes analytic.

✏ **Solution:**