



# III BRAC University

Department of Mathematics and Natural Sciences

**Total Points: 15**

**Assignment-01**

**Course Code: MAT215**

Complex

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**Section: 12**

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**Submission Date:** \_\_\_\_\_

*Assigned by*

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**Question 1**

Find all possible values of  $z$  such that

$$z^5 = 16\sqrt{2}(1 + i)$$

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:**

**Question 2**

Consider the equation

$$\left| \frac{z + 9i}{z - 9i} \right| = 2$$

Describe the above locus in the complex plane.

 **Solution:**

**?** Question 3

Consider the inequality

$$|z - 6| - |z + 6| \geq 8$$

Describe the above locus in the complex plane.

 Solution:

**Question 4**

Solve the following equation for  $z$ :

$$e^{3z} = -6$$

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

 **Solution:**

**Question 5**

Prove that

$$\coth^{-1} z = \frac{1}{2} \ln \left( \frac{z+1}{z-1} \right).$$

 Solution:

**Question 6**

Solve for  $z$ :

$$\sin^{-1} z = 4 + 9i$$

 Solution:

## ?

 Question 7

Solve

 Solution:

## ?

### Question 8

Solve

 Solution:

## ?

 Question 9

Solve

 Solution:

**?** Question 10

Using the definition show that

$$f(z) = 4z\bar{z} - 7z + 3\bar{z}$$

is not differentiable at  $z = 0$ .

 Solution:

## Question 11

Using the definition, find the derivative of

$$f(z) = \frac{4}{6z + 4} \quad \text{at} \quad z = z_0$$

 Solution:

**Question 12**

Consider the function  $f(z)$  defined by

$$f(z) = 3 \sinh(6z) - 6 \cos(6z)$$

Using C-R equations determine whether the function is analytic or not.

 **Solution:**

**Question 13**

Consider the function  $f(z)$  defined by

$$f(z) = 8ze^{-4z}$$

Using C-R equations determine whether the function is analytic or not.

 **Solution:**

**?** Question 14

Show that the given function  $v$  defined by

$$v(x, y) = 5e^{-6x} \cos(6y) - 5e^{5y} \sin(5x) + 21x^2y - 9x^2 - 7y^3 + 9y^2$$

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

 Solution:

**?** Question 15

Show that the given function  $v$  defined by

$$v(x, y) = 6xe^{-4x} \cos(4y) + 6ye^{-4x} \sin(4y)$$

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

 Solution: