



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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Assigned by

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Question 1

Find all possible values of z such that

$$z^6 = \frac{729\sqrt{2}(-1 - i)}{2}$$

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

$$\left| \frac{z + 4i}{z - 4i} \right| = 3$$

Describe the above locus in the complex plane.

 **Solution:**

Question 3

Consider the inequality

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

Describe the above locus in the complex plane.

 **Solution:**

? Question 4

Solve the following equation for z :

$$e^{5z} = -\frac{5}{2} + \frac{5\sqrt{3}i}{2}$$

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

 Solution:

? Question 5

Prove that

$$\sin^{-1} z = \frac{1}{i} \ln \left(iz + \sqrt{1 - z^2} \right),$$

 Solution:

? Question 6

Solve for z :

$$\tanh^{-1} z = 5 - 9i$$

 Solution:

?

 Question 7

Solve

 Solution:

?

Question 8

Solve

 Solution:

?

 Question 9

Solve

 Solution:

Question 10

Using the definition show that

$$f(z) = 4z^2 + 6z - 3$$

is differentiable at all points. Also find the derivative.

 Solution:

Question 11

Using the definition, find the derivative of

$$f(z) = \frac{3z - 2}{9z + 8i} \quad \text{at } z = i$$

 Solution:

?

Question 12

@Q12@

 Solution:

?

Question 13

@Q13@

 Solution:

? Question 14

Show that the given function u defined by

$$u(x, y) = 6e^{-9x} \cos(9y) - 5e^{3y} \sin(3x) + 27x^2y - 9x^2 - 9y^3 + 9y^2$$

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

 Solution:

? Question 15

Show that the given function u defined by

$$u(x, y) = 2xe^{-8x} \cos(8y) + 2ye^{-8x} \sin(8y)$$

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

 Solution: