BRAC UNIVERSITY

Inspiring Excellence

MAT 215

Fall 2020

Assignment 03

SET: F

Please write your name and ID on the assignment script. The deadline for submitting the assignment is ***10th November 2020****. Solve* ***all the problems****. You will receive* 5 *bonus marks for* ***submitting your assignment in LaTeX****.* ***No Late submissions will be accepted****.*

Any information you need to solve this exam are given in the question.

Be creative, use your intuition. Answer the questions by yourself. Cheating and Copying will lead to ***50%*** *deduction from your total marks in the course and a Zero in the assignment.* ***Total marks is 60****. Each question carries 10 marks.*

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1. Let $f(z) = y - 2xy + i(-x + x^2 - y^2) + z^2$ where $z = x + iy$ is a complex variable defined in the whole complex plane . For what values of z does $f^{'}(z)$ exist?

2. Let $u(x, y) = 2 + 3x - y + x^2 - y^2 - 4xy$. Show that $u(x, y)$ is harmonic and find the harmonic conjugate of $u(x, y)$ with $v(0, 0) = 0$.

3. Show that $f(z) = (\overline{z} + 1)^3 - 3\overline{z}$ is nowhere analytic.

4. Show that $f(z) = x^3 + 3xy^2 + i(y^3 + 3x^2y)$ is differentiable only at points that lie on the coordinate axes.

5. Let $v(x, y) = \arctan(\frac{y}{x})$ where x is not 0. Compute the partial derivatives of $u(x, y)$ and verify that $v(x, y)$ satisfies the Laplace's equation.