Assignment 1

Deadline: 23 July 2025

Instructions:
- Clearly write **your name, student ID, course code, and section** on the front page.
- Submit the hard copy of the assignment in class on the due date.
- Do not copy from others. Copying will lead you to a zero mark.

1. If $z_1 = 1 - i$, $z_2 = -2 + 4i$, and $z_3 = \sqrt{3} - 2i$, find $Re(2z_1^3 + 3z_2^3 - 5z_3^2)$ and $Im\left(\frac{z_1 z_2}{z_3}\right)$

2. Sketch the region represented by $\left|\frac{2z-3}{2z+3}\right| > 1$ in the xy-plane.

3. Find the derivative of z^{-2} at $z = -1 + i$ by using the definition.

4. Find whether the function $f(z) = 8z^3 - 3iz^2 + 4(\bar{z})^2$ is analytic or not.

5. Show that $u(x, y) = x^3 - 3xy^2 + 3x^2y - y^3 + (e^y + e^{-y})\sin x$ is a harmonic function. Also find its conjugate harmonic function v so that $u + iv$ is an analytic function of z.