Write-up your solution carefully including all the details of the proof. Due October 21. Please staple your assignment.

(1) (5 points) Compute the center of mass of the roots of \( z^7 - 3z^6 + 2z^5 + z^4 - 3z^3 + 3z^2 - 3z + 2 \) with respect to 0.

(2) (5 points) Show that \( z^7 - 3z^6 + 2z^5 + z^4 - 3z^3 + 3z^2 - 3z + 2 \) has at least one root with absolute value greater than 1.

(3) (5 points) Construct an example of a polynomial of degree \( f \geq 3 \) such that it has one simple root \( z_0 \) with the property that \( f''(z_0) = 0 \).

(4) (5 points) Use Laguerre Criterion to show that \( z^2 - 3z + 2 \) has real roots.

(5) (5 points) (graduate students) Use Viete relations together with the criterion for stability for a polynomial with real coefficients to decide whether \( z^3 + 2z^2 + 3z + 2 \) is stable.