
1. Evaluate the following integrals using residues.
   a) \( \int_0^{\pi/2} \frac{dx}{a \sin^2 x}, \ |a| > 1 \)
   b) \( \int_{-\infty}^{\infty} \frac{x^2-x+2}{x^4+10x^2+9} \, dx \)
   3) \( \int_0^{\infty} \frac{\log x}{1+x^2} \, dx \)

2. How many roots does the equation
   \[ z^7 - 2z^5 + 6z^3 - z + 1 = 0 \]
   have in the disc \(|z| < 1|\)?

3. How many roots does the equation
   \[ z^4 - 6z + 3 = 0 \]
   have in the annulus \(1 < |z| < 2|\)?