

1. Find the least common multiple of the polynomials

\[ P(x) = x^3 + x + 1 \quad \text{and} \quad Q(x) = x^2 + \beta \]

2. Find the multiplicity of the polynomial \( F_q(x) \).

3. Compute the Kronecker symbol \( \chi(a) \) for the given values of \( a \) and \( Q \).

4. Compute the Dirichlet L-series

\[ L(s, \chi) = 1 + q^{-s} \]