1. The polynomial
\[ p(z) = z^5 + 2z^4 + 2z^3 - z^2 - 2z - 2 \]
has a zero at \( z = -1 - i \). Solve the equation \( p(z) = 0 \) completely.

2. Prove that
\[ \sum_{k=1}^{n} k^22^k = 2^{n+1}(n^2 - 2n + 3) - 6, \quad n = 1, 2, 3, \ldots \]

3. Determine the remainder when \( (15^{51} + 2^{16})^{18} \) is divided by 13.

4. Find the constant term in the development of
\[ \left( \frac{x^3}{2} - \frac{1}{ix^2} \right)^{20}. \]
(Here \( i \) is the imaginary unit: \( i^2 = -1 \).)

5. Write the complex number
\[ \left( \frac{\sqrt{2}(1 - i\sqrt{3})}{(\sqrt{3} + i)(1 - i)} \right)^{58} \]
in the form \( a + ib \), where \( a, b \in \mathbb{R} \).

6. Reduce the fraction as far as possible:
\[ \frac{x^3 + 4x^2 + 4x + 3}{x^4 + x^3 + 3x^2 + 2x + 2}. \]

7. Solve one of the problems (a) or (b) below:
(a) Prove that the polynomial \( (x + 1)^{98} - (3x^2 + 9x + 7)(x + 2)^{96} + 2x + 3 \) is divisible by \( x^2 + 3x + 2 \).
(b) How many necklaces can be constructed using 9 pearls chosen from a collection of 12 different pearls?