1. Express the quotient \( z = \frac{1 + 3i}{6 + 8i} \) as \( z = re^{i\theta} \).

2. Express \( z = 10e^{i\phi} \) as \( z = a + ib \).

3. Find all values of \( r \) such that the complex number \( re^{i\phi} = a + ib \) with \( a \) and \( b \) integers.

4. Find all real and complex roots of the equation \( z^{10} = 9^{10} \).

5. Find all real and complex solutions to the equation \( x^4 - 2x^2 + 1 = 0 \).

6. Find all real and complex eigenvalues of the matrix

\[
A = \begin{bmatrix}
4 & 0 & 0 \\
0 & 1 & -1 \\
0 & 5 & -3
\end{bmatrix}
\]

7. Show that if \( p(x) \) is a polynomial with real coefficients and \( z \) is a solution of \( p(z) = 0 \), then \( \overline{z} \) is also satisfies \( p(\overline{z}) = 0 \).

8. One can identify complex numbers and vector on the plane \( \mathbb{R}^2 \) as \( a + ib \equiv (a, b) \). Find the matrix

\[
B = \begin{bmatrix}
b_{11} & b_{12} \\
b_{21} & b_{22}
\end{bmatrix}
\]
such that, using this identification,

\[
e^{i\phi}(a + ib) \equiv \left( B \begin{bmatrix} a \\ b \end{bmatrix} \right)^T
\]

where \( T \) denotes the transpose. Now use this to explain geometrically the action of the matrix \( B \) on the vector \( \begin{bmatrix} a \\ b \end{bmatrix} \).