Problem 1. Compute the real and imaginary parts of the following complex numbers:

(i) \((2 + 3i) - (1 - i)\)
(ii) \(i^3(1 + i)\)
(iii) \(\frac{2 - 2i}{1 + 3i}\)
(iv) \(\frac{2}{7} + \frac{i}{2}\)
(v) \(\frac{2i + 1}{1 - 3i} + \frac{3 + 2i}{1}\)

Problem 2. Compute the following:

(i) \(\left|\frac{1 - i}{2 + i}\right|\)
(ii) \(\left|\left(1 - 2i\right)(1 - i)\right|\)
(iii) \(\left|\frac{1 - i}{i^{2020}}\right|\)
(iv) \(\arg\left(\pi/2\right)\)
(v) \(\arg(\sqrt{3} - i)\)

Problem 3. Describe geometrically the set of points \(z\) in the complex plane defined by:

(i) \(|z - 1| = 2\)
(ii) \(z^{-1} = \overline{z}\)
(iii) \(\text{Re}(z) = 1/2\)
(iv) \(\text{Im}(z) \leq 1\)
(v) \(|z - \zeta| = |z - \xi|\) where \(\zeta, \xi\) are two complex numbers
(vi) \(\text{Im}(z) - 2\text{Re}(z) \leq 3\)
(vii) \(z\overline{z} \geq 1\)
(viii) \(z^2 = 1\)
(ix) \(z^3 = 1\)
(x) \(z^n = 1\) for any \(n \in \mathbb{N}\)

Problem 4. Show that

(i) for any complex number \(z\), \(\text{Re}(iz) = -\text{Im}(z)\) and \(\text{Im}(iz) = \text{Re}(z)\),
(ii) for any integer \(n \in \mathbb{Z}\), \(i^{4n} = 1, i^{4n+1} = i, i^{4n+2} = -1, i^{4n+3} = -i\), and compute \(i^{2020}\) and \(i^{-2020}\),
(iii) the complex numbers \(z_1 = i, z_2 = -2 - 3i\) are solutions of the equation \((i - 1)z^2 - 4z - 1 + 5i = 0\).

Problem 5. Solve the following equations:

(i) \(iz = 8 + 4i - 3iz\)
(ii) \(\frac{(2-i)z}{1+z} = 1 + 3i\), where \(z \neq -1\)
(iii) \((3 + 2i)z + 5z^2 = 0\)
(iv) \(z^2 + 2z + 2 = 0\)