Problem 0.1

Express each of the following complex numbers in *Cartesian* form $x + iy$:

$$\frac{1}{2}e^{i\pi} \qquad \frac{1}{2}e^{-i\pi} \qquad e^{i\pi/2}$$
$$e^{-i\pi/2} \qquad e^{i5\pi/2} \qquad \sqrt{2}e^{i\pi/4}$$
$$\sqrt{2}e^{i9\pi/4} \qquad \sqrt{2}e^{-9i\pi/4} \qquad \sqrt{2}e^{-i\pi/4}$$

Problem 0.2

Express each of the following complex numbers in *polar* form ($re^{i\theta}, -\pi < \theta \le -\pi$):

$$5 \qquad -2 \qquad -3i$$
$$\frac{1}{2} - i\frac{\sqrt{3}}{2} \qquad 1 + i \qquad (1-i)^2$$
$$i(1-i) \qquad \frac{1+i}{1-i} \qquad \frac{\sqrt{2}+i\sqrt{2}}{1+i\sqrt{3}}$$

Every complex number $a + ib$ can be visualized in the complex plane $\mathbb{C}$. It can be viewed as the point with the coordinate (a, b) in the plane or as a vector starting from $0, 0$ to the point (a, b).

Also every complex number $a + ib$ can be represented in the exponential form conveniently through the Euler's formula $e^{i\alpha} = \cos\alpha + i\sin\alpha$.

$z = a + ib = re^{i\theta}$

$e^{i\alpha} = \cos\alpha + i\sin\alpha$