signal and system chapter 1 problems

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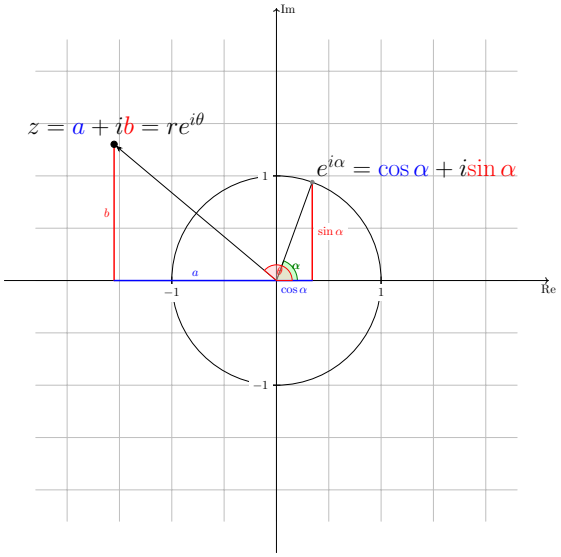

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summary of this post

1 Basic Problems With Answers

Problem 1.1

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

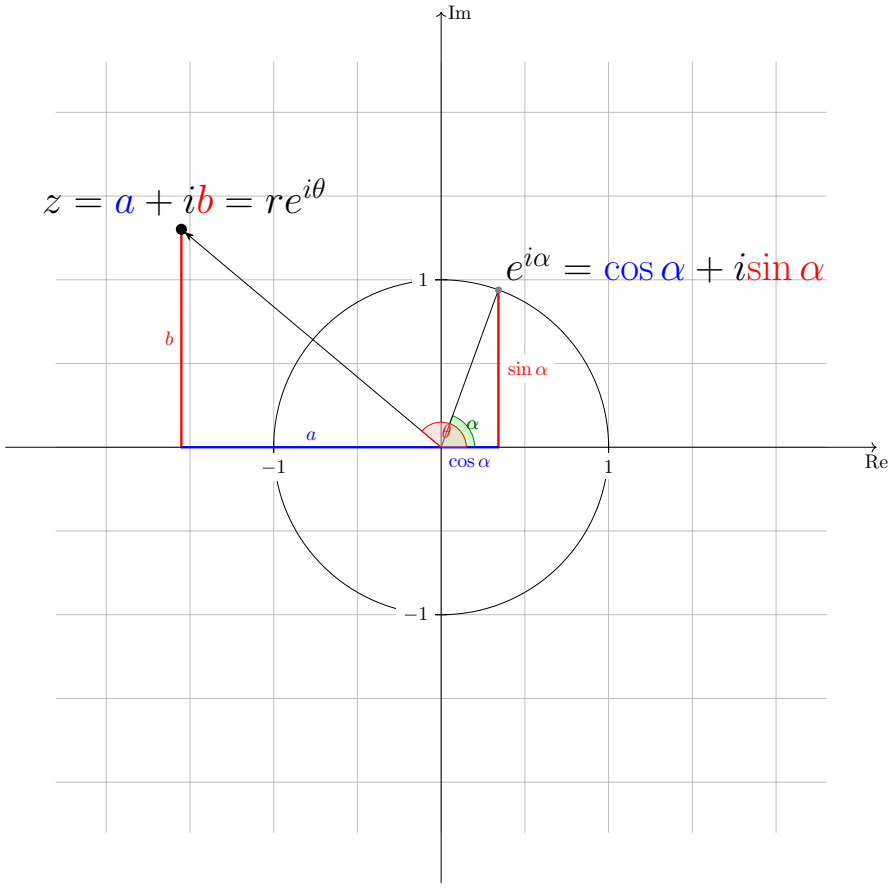
$$\begin{array}{ccc} \frac{1}{2}e^{i\pi} & \frac{1}{2}e^{-i\pi} & e^{i\pi/2} \\ e^{-i\pi/2} & e^{i5\pi/2} & \sqrt{2}e^{i\pi/4} \\ \sqrt{2}e^{i9\pi/4} & \sqrt{2}e^{-9i\pi/4} & \sqrt{2}e^{-i\pi/4} \end{array}$$

Problem 1.2

Express each of the following complex numbers in *polar* form ($re^{i\theta}, -\pi < \theta \leq -\pi$):
$5, -2, -3i, \frac{1}{2} - i\frac{\sqrt{3}}{2}, 1+i, (1-i)^2, i(1-i), (1+i)/(1-i), (\sqrt{2}+i\sqrt{2})/(1+i\sqrt{3})$

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


Im
Re
$z = a + ib = re^{i\theta}$
$e^{i\alpha} = \cos\alpha + i\sin\alpha$
1
−1
1
−1
b
a
sin α
cos α
α
θ