KUTAISI INTERNATIONAL UNIVERSITY

Quiz (G-1)

Linear Algebra for Informatics
Fall semester 2024
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Definition

Consider two $n \times n$ matrices A and B. We say that A is similar to B if there exists an invertible matrix S such that:

$$AS = SB, \quad \text{or} \quad B = S^{-1}AS$$

Problem

is matrix $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ similar to $B = \begin{pmatrix} 5 & 0 \\ 0 & -1 \end{pmatrix}$?

Solution

We want to find the matrix:

$$S = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \text{ such that } AS = BS \text{ or just } \begin{pmatrix} a+2c & b+2d \\ 4a+3c & 4b+3d \end{pmatrix} = \begin{pmatrix} 5a & -b \\ 5c & -d \end{pmatrix} \Rightarrow c = 2a,\ d = -b$$

$$\text{so } S = \begin{pmatrix} a & b \\ 2a & -b \end{pmatrix}$$

Problem

Compute $(3+4i)\left(-2-\frac{i}{2}\right)-4+i$

Compute $\frac{2-i}{-1-3i}$ and then try to plot it

Solution

$$(3+4i)\left(-2-\frac{i}{2}\right)-4+i=\left(-6-\frac{3i}{2}-8i-2i^2\right)-4+i \overset{\text{since } i^2=-1}{=}$$
$$=\left(-6-\frac{19i}{2}+2\right)-4+i=-8-\frac{17i}{2}$$

$$\frac{2-i}{-1-3i}=\frac{(2-i)(-1+3i)}{(-1-3i)(-1+3i)}=\frac{-2+6i+i-3i^2}{1-9i^2}=\frac{1+7i}{10}$$ Done

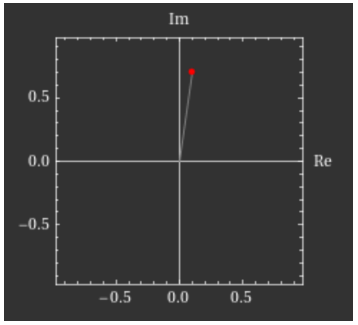

Figure 1: