

Matrix theory Assignment 1

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Abstract—This document contains the solution complex numbers problem. Download all python codes from

2 SOLUTION

<https://github.com/sahilsin/MatrixTheory/Assignment1/codes>

a) Below is the solution :

$$\Rightarrow \frac{\begin{pmatrix} 1 \\ 7 \end{pmatrix}}{\begin{pmatrix} 2 \\ -1 \end{pmatrix}^2} \quad (2.0.1)$$

$$\begin{pmatrix} 2 \\ -1 \end{pmatrix}^2 = \begin{pmatrix} 2 & 1 \\ -1 & 2 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.2)$$

$$\Rightarrow \begin{pmatrix} 2 \\ -1 \end{pmatrix}^2 = \begin{pmatrix} 3 & 4 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.3)$$

$$\Rightarrow \begin{pmatrix} 2 \\ -1 \end{pmatrix}^2 = \begin{pmatrix} 3 \\ -4 \end{pmatrix} \quad (2.0.4)$$

$$\Rightarrow \begin{pmatrix} 1 \\ 7 \end{pmatrix} \begin{pmatrix} 3 \\ -4 \end{pmatrix}^{-1} \quad (2.0.5)$$

$$\Rightarrow \frac{1}{25} \begin{pmatrix} 1 & -7 \\ 7 & 1 \end{pmatrix} \begin{pmatrix} 3 & -4 \\ 4 & 3 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.6)$$

$$\Rightarrow \frac{1}{25} \begin{pmatrix} -25 & -25 \\ 25 & -25 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.7)$$

$$\Rightarrow \frac{25}{25} \begin{pmatrix} -1 & -1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.8)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \frac{-1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \\ 1 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.9)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \cos 135^\circ & -\sin 135^\circ \\ \sin 135^\circ & \cos 135^\circ \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.10)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \cos 135^\circ \\ \sin 135^\circ \end{pmatrix} \quad (2.0.11)$$

$$\Rightarrow \sqrt{2} \angle 135^\circ \quad (2.0.12)$$

1 PROBLEM

Convert the following in Polar form:

$$a) \frac{\begin{pmatrix} 1 \\ 7 \end{pmatrix}}{\begin{pmatrix} 2 \\ -1 \end{pmatrix}^2} \quad (1.0.1)$$

$$b) \frac{\begin{pmatrix} 1 \\ 3 \end{pmatrix}}{\begin{pmatrix} 1 \\ -2 \end{pmatrix}} \quad (1.0.2)$$

b) Below is the solution:

$$\Rightarrow \frac{\begin{pmatrix} 1 \\ 3 \end{pmatrix}}{\begin{pmatrix} 1 \\ -2 \end{pmatrix}} \quad (2.0.13)$$

$$\begin{pmatrix} 1 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.14)$$

$$\Rightarrow \begin{pmatrix} 1 \\ 7 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \end{pmatrix}^{-1} \quad (2.0.15)$$

$$\Rightarrow \frac{1}{5} \begin{pmatrix} 1 & -3 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.16)$$

$$\Rightarrow \frac{1}{5} \begin{pmatrix} -5 & -5 \\ 5 & -5 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.17)$$

$$\Rightarrow \frac{5}{5} \begin{pmatrix} -1 & -1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.18)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \frac{-1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \\ 1 & -1 \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} \quad (2.0.19)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \cos 135^\circ & -\sin 135^\circ \\ \sin 135^\circ & \cos 135^\circ \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (2.0.20)$$

$$\Rightarrow \sqrt{2} \begin{pmatrix} \cos 135^\circ \\ \sin 135^\circ \end{pmatrix} \quad (2.0.21)$$

$$\Rightarrow \sqrt{2} \angle 135^\circ \quad (2.0.22)$$