

The inverse of a 2x2 matrix of complex numbers

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Abstract

In this paper, I describe the inverse of a 2x2 matrix of complex numbers.
The paper ends with "The End"

Introduction

The general 2x2 matrix of complex numbers is

$$M = \begin{pmatrix} a + ib & c + id \\ e + if & g + ih \end{pmatrix}$$

where

a, b, c, d, e, f, g, h are real and $i^2 + 1 = 0$.

In this paper, I describe the inverse of M.

The determinant of M

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$$\det M = ag - bh - ce + df + iah + ibg - icf - ide = 0$$

$$\Longleftrightarrow$$

$$(b = ia \wedge d = ic) \vee (b = ia \wedge c + id \neq 0 \wedge f = ie) \vee \left(b - ia \neq 0 \wedge h = \frac{ag + ibg - ce - icf - ide + df}{b - ia} \right)$$

The inverse of M

If

$$\det M \neq 0$$

then

$$M^{-1} = \frac{1}{\det M} \begin{pmatrix} g + ih & -c - id \\ -e - if & a + ib \end{pmatrix}$$

The End