

Homework No. 07 (Fall 2021)

PHYS 500A: MATHEMATICAL METHODS

Department of Physics, Southern Illinois University–Carbondale

Due date: Thursday, 2021 Oct 28, 4.30pm

1. (20 points.) Consider the matrix

$$A = \begin{pmatrix} \cos \theta & \sin \theta \\ \sin \theta & -\cos \theta \end{pmatrix}. \quad (1)$$

- (a) Find all the eigenvalues of the matrix A .
- (b) Find the normalized eigenvectors associated with all the eigenvalues of matrix A . (Simplification is achieved by writing the trigonometric functions in terms of half angles. $1 - \cos \theta = 2 \sin^2 \theta/2$, $1 + \cos \theta = 2 \cos^2 \theta/2$, $\sin \theta = 2 \sin \theta/2 \cos \theta/2$.)
- (c) Determine the matrix that diagonalizes the matrix A .