Homework No. 04 (2019 Spring)

PHYS 301: Theoretical Methods in Physics

Due date: Friday, 2019 Feb 8, 9:00 AM, in class

1. (**40 points.**) Consider the matrix

$$\mathbf{A} = \begin{pmatrix} \cosh\theta & \sinh\theta \\ \sinh\theta & \cosh\theta \end{pmatrix}. \tag{1}$$

   (a) Find the eigenvalues of the matrix $\mathbf{A}$.

   (b) Find the normalized eigenvectors of matrix $\mathbf{A}$.

   (c) Determine the matrix that diagonalizes the matrix $\mathbf{A}$.

   (d) What can you then conclude about the eigenvalues and eigenvectors of $\ln\mathbf{A}$? Find them.

2. (**40 points.**) Consider the rotation matrix

$$\mathbf{A} = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}. \tag{2}$$

   (a) Find the eigenvalues of the matrix $\mathbf{A}$.

   (b) Find the normalized eigenvectors of matrix $\mathbf{A}$.

   (c) Determine the matrix that diagonalizes the matrix $\mathbf{A}$.

   (d) What can you then conclude about the eigenvalues and eigenvectors of $\mathbf{A}^{107}$? Find them.