

5. [16 points] Consider the system

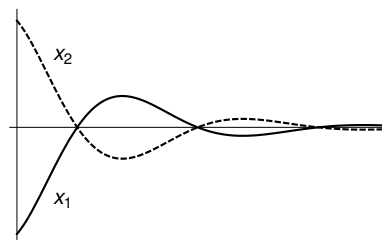
$$\mathbf{x}' = \mathbf{A}\mathbf{x}, \tag{1}$$

for some real-valued, constant, 2×2 matrix \mathbf{A} . Suppose that one solution to (1) is $\mathbf{x} = \begin{pmatrix} -1 \\ 1 \end{pmatrix} e^{-t}$. Identify each of the following as true or false, by circling “True” or “False” as appropriate, and provide a short (one sentence) explanation indicating why you selected that answer.

a. [4 points] A possible component plot of solutions to (1) is

True

False



b. [4 points] The general solution to (1) could be $\mathbf{x} = c_1 \begin{pmatrix} 1 \\ -1 \end{pmatrix} e^{-t} + c_2 \begin{pmatrix} 0 \\ 1 \end{pmatrix} e^t$.

True

False

c. [4 points] The equation $\mathbf{A}\mathbf{w} = -\mathbf{w}$ has infinitely many solutions \mathbf{w} .

True

False

d. [4 points] An eigenvalue of the matrix \mathbf{A} could be $\lambda = 1 + i$.

True

False