Exercise Problem Sets 3

Mar. 12. 2021

Problem 1. Solve $\boldsymbol{X}' = \boldsymbol{A}\boldsymbol{X}$ for the following $\boldsymbol{A}$ by the methodology that we talked about in class.

1. $\boldsymbol{A} = \begin{bmatrix} 5 & -4 & 0 \\ 1 & 0 & 2 \\ 0 & 2 & 5 \end{bmatrix}$.
2. $\boldsymbol{A} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 1 \\ 0 & -1 & 1 \end{bmatrix}$.
3. $\boldsymbol{A} = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 2 & -1 \\ 0 & 1 & 0 \end{bmatrix}$.
4. $\boldsymbol{A} = \begin{bmatrix} 1 & -1 & 2 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$.
5. $\boldsymbol{A} = \begin{bmatrix} 4 & 0 & 1 \\ 0 & 6 & 0 \\ -4 & 0 & 4 \end{bmatrix}$.
6. $\boldsymbol{A} = \begin{bmatrix} 2 & 4 & 4 \\ -1 & -2 & 0 \\ -1 & 0 & -2 \end{bmatrix}$.
7. $\boldsymbol{A} = \begin{bmatrix} 2 & 1 & 0 & -2 \\ 0 & 2 & 1 & 2 \\ 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 2 \end{bmatrix}$.
8. $\boldsymbol{A} = \begin{bmatrix} 4 & -2 & 0 & 2 \\ 0 & 6 & -2 & 0 \\ 0 & 2 & 2 & 0 \\ 0 & -2 & 0 & 6 \end{bmatrix}$.
9. $\boldsymbol{A} = \begin{bmatrix} 6 & 5 & 9 & 4 \\ -8 & -6 & -11 & -8 \\ 1 & 1 & 0 & 1 \\ 0 & -1 & 1 & 2 \end{bmatrix}$.
10. $\boldsymbol{A} = \begin{bmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 0 \end{bmatrix}$.
11. $\boldsymbol{A} = \begin{bmatrix} a & 0 & 1 & 0 & 0 \\ 0 & a & 0 & 1 & 0 \\ 0 & 0 & a & 0 & 1 \\ 0 & 0 & 0 & a & 0 \\ 0 & 0 & 0 & 0 & a \end{bmatrix}$, where a is a given constant.

Remark: It is easier to solve 11 by solving for x_5 and x_4 first and then solve for x_3, x_2, and finally solving for x_1. However, in order to make sure that you understand what I talked about in class, please avoid solving this problem in this way.