



- ★ Homework #5, review of Linear Algebra, and the start of systems of ODEs, homogeneous constant coefficient case
- ★ Please prepare to present your solutions to class in the next meeting.
- ★ Students on path to a Ph.D. want to practice typing up the answers and including graphs and matrices using \TeX when applicable.

Remember the transpose operation: if $V = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$ then $V^t = [a, b, c]$.

1- Let $A = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 4 & 1 \\ 3 & 5 & 2 \end{bmatrix}$, $D = \begin{bmatrix} 2 & 0 \\ 0 & 5 \end{bmatrix}$.

Find the following and if the indicated item does not exist explain.

$A^2, 2A, BA, AB, A^t B, AC, CA, DB, BD, B^2, B^3, D^2, D^3$.

Is $BD = DB$? Explain.

2- Consider the ODE system

$$\begin{cases} x' = 3x - 2y \\ y' = 2x - 2y \end{cases}, \text{ with initial conditions } \begin{cases} x(0) = 2 \\ y(0) = 3 \end{cases}.$$

solve it by conversion to a second order ODE. Find $\begin{bmatrix} x(t) \\ y(t) \end{bmatrix}$.

3- Consider the second order ODE $x'' + 7x' + 12x = 0$, $x(0) = 2$, $x'(0) = 3$. Convert the system and the initial condition to a system of first order ODEs.
