Submitting HW Tips

HW # 1

1 **TRUE or FALSE** Question: $(AB)^2 = A^2 B^2$ for all 2×2 matrices A and B.
(You must provide a justification for **T** or **F**.)

2 Write the vector $\vec{\boldsymbol{v}} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as a linear combination of the vectors $\vec{\boldsymbol{v}}_1, \vec{\boldsymbol{v}}_2, \vec{\boldsymbol{v}}_3 \in \mathbb{R}^3$ (if possible), where

$$\vec{\boldsymbol{v}}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \ \vec{\boldsymbol{v}}_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \ \vec{\boldsymbol{v}}_3 = \begin{bmatrix} 3 & 2 & 1 \end{bmatrix}^t.$$

3 Find constants C_1, C_2, C_3, if possible, so that

$$C_1(3x^2+2) + C_2(2x-1) + C_3x^2 = 2x+1, \quad \forall x \in \mathbb{R}.$$

4 If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$, find all 2×2 matrices B such that $AB = BA$. (There are infinitely many possible matrices B.)

Remark: Whenever $AB = BA$, the matrices A and B are said to *commute*. This is related to Problem $\boxed{1}$ above.

5 Page 38: **#1.49, 1.53**.

6 A city council is trying to determine if traffic lights are needed at certain intersections. Below is the data collected for the number of cars entering or leaving each of the four intersections per hour. **Set up but do not solve** a linear system in the unknowns x_1, x_2, x_3, and x_4 (assume no accidents):