1. Compute $A^{-1} \in \mathbb{R}^{3\times 3}$ using elimination. Show your work (write down the row operations used in each step). *[4 points]*

$$A = \begin{pmatrix} 1 & 2 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}.$$

2. Answer the following **T**rue/**F**alse questions about $M, N, P \in \mathbb{R}^{n\times n}$ by circling the correct answer. **When the answer is false, mention why!** *[1 point each]*

   (a) It is always true that $(MP)^2 = M^2P^2$. **T** **F**

   (b) Consider the block matrices $(M \mid N) \in \mathbb{R}^{n\times 2n}$ and $\begin{pmatrix} M \\ P \end{pmatrix} \in \mathbb{R}^{2n\times n}$.

   Then, $(M \mid N)\begin{pmatrix} M \\ P \end{pmatrix} = M^2 + NP$. **T** **F**

   (c) $(MP)^{-1}$ can still exist if row 2 of M is three times row 1 of M. **T** **F**

3. Use elimination to compute the LDU factorization of $A \in \mathbb{R}^{2\times 2}$ below. That is, find a lower triangular matrix $L \in \mathbb{R}^{2\times 2}$, a diagonal matrix $D \in \mathbb{R}^{2\times 2}$, and an upper triangular matrix $U \in \mathbb{R}^{2\times 2}$ with ones on the diagonal, such that $A = LDU$. Show all your steps. *[3 points]*

$$A = \begin{pmatrix} 3 & 1 \\ -1 & -2 \end{pmatrix}.$$