1) (12 pts) Find the null space and the column space for the matrix $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 5 & 7 & 9 \end{bmatrix}$. Give the dimension of each of the two subspaces you found.

2) (12 pts) Re-do problem 1 using $\mathbf{A}^T$ instead.

3) (6 pts) Find the sum of the dimensions of the two subspaces from problem 1, then do so again for problem 2. Note that $\mathbf{A}$ is 3×4. How do the dimensions of these subspaces relate to the dimensions of $\mathbf{A}$?