Slide #3. Let

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

- The row space of A consists of all linear combinations of its rows. Thus, the row space of A equals

$$\{0000, 1000, 0100, 1100\}.$$

- The three rows of A are linearly dependent (because row 1 + row 2 + row 3 = 0000). However, row 1 and row 2 (for example) are linearly independent. Thus, the rank of A equals 2. Alternatively, observe that the first two columns of A are linearly independent.

- The null space of A is the set of all solutions to $A\vec{x} = \vec{0}$. Thus, the column space of A equals

$$\left\{ \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ 1 \end{bmatrix} \right\}.$$

- $\dim \operatorname{Nul} A = 2$.