3) (3 pts) Short answer: Let A be a 5 x 6 matrix whose rank is k

a) What is the largest value that k can be?

5

b) How many vectors are in a basis for the row space of A?

K

c) State why $\langle \mathbf{u}, \mathbf{v} \rangle = u_1 v_1$ is not an inner product for $\mathbf{u} = (u_1, u_2)$, $\mathbf{v} = (v_1, v_2)$

$\langle (0,1),(0,1) \rangle = 0$

So $\langle \vec{v}, \vec{v} \rangle = 0$ but $\vec{v} \neq \vec{0}$

not an inner product

4) (~~10~~ 12 pts) Let B = {(1, 0, 1), (0, 1, 1), (0, 0, 1)} and B' = {(1, 0, 0), (1, 1, 0), (1, 1, 1)}
Find the transition matrix from B to B'.

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{array}\right] \xrightarrow{-R_2+R_1} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{array}\right]$$

$$\xrightarrow{-R_3+R_2} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & -1 & 0 & -1 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{array}\right]$$

$$P^{-1} = \begin{bmatrix} 1 & -1 & 0 \\ -1 & 0 & -1 \\ 1 & 1 & 1 \end{bmatrix}$$