(Q6)

Proof. We formulate a homogenous system from the set given to us:

$$\begin{cases} a\mathbf{x} + c\mathbf{y} = 0 \\ b\mathbf{x} + d\mathbf{y} = 0 \end{cases}$$

We can then row-reduce:

$$\begin{pmatrix} a & c & | & 0 \\ b & d & | & 0 \end{pmatrix} \to \begin{pmatrix} 1 & \frac{c}{a} & | & 0 \\ b & d & | & 0 \end{pmatrix} \to \begin{pmatrix} 1 & \frac{c}{a} & | & 0 \\ 0 & \frac{ad-bc}{a} & | & 0 \end{pmatrix}$$

Since $ad - bc \neq 0$, this is not yet in RREF and we continue to row-reduce.

$$\begin{pmatrix} 1 & \frac{c}{a} & | & 0 \\ 0 & 1 & | & 0 \end{pmatrix} \to \begin{pmatrix} 1 & 0 & | & 0 \\ 0 & 1 & | & 0 \end{pmatrix}$$

Which forms a linearly independent set. ■