

Use the rank-nullity theorem to show that if  $V = \left\{ \begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} \in \mathbb{R}^4 : x + y + z = 0, x + 2y + 3z = 0 \right\}$ ,

then  $\dim(V) = 2$ . (Note: please be very explicit about exactly how you're using the rank-nullity theorem.)