1. Determine the value of $r$ for which

$$v = \begin{bmatrix} 1 \\ r \\ 2 \end{bmatrix}$$

is in the span of

$$S = \left\{ \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, \begin{bmatrix} -1 \\ -2 \\ 2 \end{bmatrix} \right\}.$$

2. Find a subset of the following set $S$ of vectors in $\mathbb{R}^3$ with the same span as $S$ that is as small as possible.

$$S = \left\{ \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ -3 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right\}.$$