

Find all real numbers  $k$  such that the vector  $\mathbf{v} = (1, -2, k)$  in  $\mathbb{R}^3$  (with the usual operations) is in the linear span of the vectors  $\mathbf{x} = (3, 0, -2)$  and  $\mathbf{y} = (2, -1, -5)$ .

**Prove your answer.** Be sure to address both **necessity** and **sufficiency**. Show all work.