

**Part 1** *Your answer to this part should be entered/uploaded directly to Crowdmark.*

Rewrite the following informal statements precisely, using linear algebra vocabulary.

- You can get anywhere with  $\vec{u}$  and  $\vec{v}$ .
- The lines  $\ell_1$  and  $\ell_2$  don't cross.

**(PAR) Part 2** *Prepare your response to this part on the PAR Worksheet. You will bring your writeup of this problem to class and will upload both your draft and a final version to Crowdmark after completing the PAR process.*

Jack and Tammy are taking MAT223 and want to find the point of intersection between the lines  $\ell_1, \ell_2 \subseteq \mathbb{R}^2$ , given in vector form by

$$\overbrace{\vec{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} t + \begin{bmatrix} 0 \\ 2 \end{bmatrix}}^{\ell_1}, \quad \overbrace{\vec{x} = \begin{bmatrix} 1 \\ -2 \end{bmatrix} t + \begin{bmatrix} 1 \\ 3 \end{bmatrix}}^{\ell_2}.$$

To find the intersection, Jack sets both equations equal and does the following computation:

$$\begin{aligned} \begin{bmatrix} 1 \\ 0 \end{bmatrix} t + \begin{bmatrix} 0 \\ 2 \end{bmatrix} &= \begin{bmatrix} 1 \\ -2 \end{bmatrix} t + \begin{bmatrix} 1 \\ 3 \end{bmatrix} \\ \begin{bmatrix} 1 \\ 0 \end{bmatrix} t - \begin{bmatrix} 1 \\ -2 \end{bmatrix} t &= \begin{bmatrix} 1 \\ 3 \end{bmatrix} - \begin{bmatrix} 0 \\ 2 \end{bmatrix} \\ \begin{bmatrix} 0 \\ 2 \end{bmatrix} t &= \begin{bmatrix} 1 \\ 1 \end{bmatrix} \end{aligned}$$

Jack then announces that  $0t = 1$  has no solution, so the lines can't intersect. Tammy says Jack must have made a mistake somewhere because the lines aren't parallel, so they have to cross.

Explain to Jack and Tammy what is going on. In your explanation, be sure to mention whether or not the lines cross, and to point out any errors in Jack's or Tammy's reasoning. Remember, Jack and Tammy are MAT223 students, so explain to them using terms they would understand.

**Part 3** *Your answer to this part should be entered/uploaded directly to Crowdmark.*

What type of thinking do you expect to do in MAT223? How is this type of thinking similar or different to the types of thinking you might do in classes for other subjects? Please give some examples.