Recall that

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

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1. Jack, you've made a mistake. The t's can be different. You need to set them different when you solve, and then you'll see Naomi is correct.

2.

$$\ell_1 \cap \ell_2 \neq \{\}$$

$$\iff$$

$$\begin{bmatrix}1\\0\end{bmatrix} t + \begin{bmatrix}0\\2\end{bmatrix} = \begin{bmatrix}1\\-2\end{bmatrix} s + \begin{bmatrix}1\\3\end{bmatrix} \qquad \Longrightarrow \qquad t = \frac{1}{2} \quad s = \frac{3}{2}$$

So the lines intersect as Naomi said.

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3. The 't' that shows up in the vector form of a line is a dummy variable. To determine if two lines written in vector form intersect, you need to replace t with a real variable. For example, you could solve

$$\begin{bmatrix}1\\0\end{bmatrix} t + \begin{bmatrix}0\\2\end{bmatrix} = \begin{bmatrix}1\\-2\end{bmatrix} s + \begin{bmatrix}1\\3\end{bmatrix}.$$