$$
\begin{aligned}
\mathbf{b}\times\mathbf{a} &= \det\begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & -1 & 2 \\ 1 & 2 & 3 \end{bmatrix} = \hat{\boldsymbol{\imath}}\det\begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & -1 & 2 \\ 1 & 2 & 3 \end{bmatrix} - \hat{\boldsymbol{\jmath}}\det\begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & -1 & 2 \\ 1 & 2 & 3 \end{bmatrix} + \hat{\mathbf{k}}\det\begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & -1 & 2 \\ 1 & 2 & 3 \end{bmatrix} \\
&= \hat{\boldsymbol{\imath}}\,\{(-1)\times 3 - 2\times 2\} - \hat{\boldsymbol{\jmath}}\,\{1\times 3 - 2\times 1\} + \hat{\mathbf{k}}\,\{1\times 2 - (-1)\times 1\} \\
&= -7\,\hat{\boldsymbol{\imath}} - \hat{\boldsymbol{\jmath}} + 3\,\hat{\mathbf{k}}
\end{aligned}
$$