

$$\begin{aligned}
 \mathbf{b} \times \mathbf{a} &= \det \begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & 2 \\ 1 & 2 & 3 \end{bmatrix} = \hat{i} \det \begin{bmatrix} \cancel{1} & \hat{j} & \hat{k} \\ \cancel{1} & -1 & 2 \\ \cancel{1} & 2 & 3 \end{bmatrix} - \hat{j} \det \begin{bmatrix} \hat{i} & \cancel{1} & \hat{k} \\ 1 & \cancel{-1} & 2 \\ 1 & 2 & \cancel{3} \end{bmatrix} + \hat{k} \det \begin{bmatrix} \hat{i} & \hat{j} & \cancel{1} \\ 1 & -1 & \cancel{2} \\ 1 & 2 & \cancel{3} \end{bmatrix} \\
 &= \hat{i} \{ (-1) \times 3 - 2 \times 2 \} - \hat{j} \{ 1 \times 3 - 2 \times 1 \} + \hat{k} \{ 1 \times 2 - (-1) \times 1 \} \\
 &= -7\hat{i} - \hat{j} + 3\hat{k}
 \end{aligned}$$