$$\hat{\boldsymbol{\imath}} \times \hat{\boldsymbol{\jmath}} = \det \begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} = \hat{\boldsymbol{\imath}} \det \begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} - \hat{\boldsymbol{\jmath}} \det \begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} + \hat{\mathbf{k}} \det \begin{bmatrix} \hat{\boldsymbol{\imath}} & \hat{\boldsymbol{\jmath}} & \hat{\mathbf{k}} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

$$= \hat{\boldsymbol{\imath}} \left(0 \times 0 - 0 \times 1\right) - \hat{\boldsymbol{\jmath}} \left(1 \times 0 - 0 \times 0\right) + \hat{\mathbf{k}} \left(1 \times 1 - 0 \times 0\right) = \hat{\mathbf{k}}$$