Answer on Question #46340 – Math – Vector Calculus

Problem.

For the vectors □(□(→┬a)) =xyz□(→┬i)-2xz^2 □(→┬j)+xz□(→┬k) and □(→┬b)=2z□(→┬i)+y□(→┬j)-x□(→┬k)

Find ∂^2/∂x∂y (□(→┬a)×□(→┬b)) at (2,0,-1)

Remark: I suppose that the statement is incorrectly formatted. The correct statement is:

"For the vectors $\vec{a} = xyz\vec{\imath} - 2xz^2\,\vec{\jmath} + xz\vec{k}$ and $\vec{b} = 2z\vec{\imath} + y\vec{\jmath} - x\vec{k}$

Find $\frac{\partial^2}{\partial x \partial y}(\vec{a} \times \vec{b})$ at (2,0,-1)"

Solution:

$$\vec{a} \times \vec{b} = \det\begin{bmatrix} \vec{\imath} & \vec{\jmath} & \vec{k} \\ xyz & -2xz^2 & xz \\ 2z & y & -x \end{bmatrix} = (2x^2z^2 - xyz)\vec{\imath} + (x^2yz + 2z^2x)\vec{\jmath} + (y^2xz + 4z^3x)\vec{k}$$

$$\frac{\partial^2}{\partial x \partial y}\left(\vec{a} \times \vec{b}\right) = -z\vec{\imath} + 2xz\vec{\jmath} + 2yz\vec{k}$$

For $(x, y, z) = (2,0,-1)$ we have $\frac{\partial^2}{\partial x \partial y}\left(\vec{a} \times \vec{b}\right)(2,0,-1) = \vec{\imath} - 4\vec{\jmath} + 0\vec{k} = (1,-4,0)$.

Answer: $\vec{\imath} - 4\vec{\jmath} + 0\vec{k} = (1,-4,0)$.