

Answer on Question #56127 – Math – Vector Calculus

Let

$$A = 2x^2i - 3yzj + xz^2k$$

and

$$\varphi = 2z - x^3y$$

, find

$$A \cdot \nabla \varphi$$

at point (1, -1, 1).

5

3

4

1

Solution

$$\nabla \varphi = \left\langle \frac{\partial}{\partial x}(2z - x^3y), \frac{\partial}{\partial y}(2z - x^3y), \frac{\partial}{\partial z}(2z - x^3y) \right\rangle = \langle -3x^2y, -x^3, 2 \rangle,$$

$$A = \langle 2x^2, -3yz, xz^2 \rangle$$

$$\nabla \varphi|_{(1, -1, 1)} = \langle -3 \cdot 1^2(-1), -1^3, 2 \rangle = \langle 3, -1, 2 \rangle,$$

$$A|_{(1, -1, 1)} = \langle 2 \cdot 1^2, -3 \cdot (-1) \cdot 1, 1 \cdot 1^2 \rangle = \langle 2, 3, 1 \rangle$$

$$A \cdot \nabla \varphi|_{(1, -1, 1)} = 3 \cdot 2 + (-1) \cdot 3 + 2 \cdot 1 = 5$$