

Vector Calculus
Grad, Div and Curl

Question

Calculate **div** \underline{F} and **curl** \underline{F} for the vector field

$$\underline{F} = xy^2\underline{i} - yz^2\underline{j} + zx^2\underline{k}$$

Answer

$$\begin{aligned}\operatorname{div}\underline{F} &= \frac{\partial}{\partial x}(xy^2) + \frac{\partial}{\partial y}(-yz^2) + \frac{\partial}{\partial z}(zx^2) \\ &= y^2 - z^2 + x^2 \\ \operatorname{curl}\underline{F} &= \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ xy^2 & -yz^2 & zx^2 \end{vmatrix} = 2yz\underline{i} - 2xz\underline{j} - 2xy\underline{k}\end{aligned}$$