

$$\begin{aligned} \text{(a) } \operatorname{curl} \mathbf{F} &= \nabla \times \mathbf{F} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x^2yz & xy^2z & xyz^2 \end{vmatrix} \\ &= (xz^2 - xy^2) \mathbf{i} - (yz^2 - x^2y) \mathbf{j} + (y^2z - x^2z) \mathbf{k} \\ &= x(z^2 - y^2) \mathbf{i} + y(x^2 - z^2) \mathbf{j} + z(y^2 - x^2) \mathbf{k} \end{aligned}$$

$$\begin{aligned} \text{(b) } \operatorname{div} \mathbf{F} &= \nabla \cdot \mathbf{F} = \frac{\partial}{\partial x} (x^2yz) + \frac{\partial}{\partial y} (xy^2z) + \frac{\partial}{\partial z} (xyz^2) \\ &= 2xyz + 2xyz + 2xyz = 6xyz \end{aligned}$$