(a) $\text{curl }\mathbf{F} = \nabla \times \mathbf{F} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ \ln x & \ln(xy) & \ln(xyz) \end{vmatrix}$

$= \left( \dfrac{xz}{xyz} - 0 \right)\mathbf{i} - \left( \dfrac{yz}{xyz} - 0 \right)\mathbf{j} + \left( \dfrac{y}{xy} - 0 \right)\mathbf{k} = \left\langle \dfrac{1}{y}, -\dfrac{1}{x}, \dfrac{1}{x} \right\rangle$

(b) $\text{div }\mathbf{F} = \nabla \cdot \mathbf{F} = \dfrac{\partial}{\partial x}\left( \ln x \right) + \dfrac{\partial}{\partial y}\left( \ln(xy) \right) + \dfrac{\partial}{\partial z}\left( \ln(xyz) \right)$

$= \dfrac{1}{x} + \dfrac{x}{xy} + \dfrac{xy}{xyz} = \dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$