1.20

$$
\begin{aligned}
\nabla(fg) &= f\nabla g + g\nabla f \\
\frac{\partial}{\partial x}(fg) &= \frac{\partial f}{\partial x}g + f\frac{\partial g}{\partial x} \rightarrow \text{Lo mismo para y, z} \\
&= f\frac{\partial g}{\partial x}\hat{i} + g\frac{\partial f}{\partial x}\hat{i} + f\frac{\partial g}{\partial y}\hat{j} + g\frac{\partial f}{\partial y}\hat{j} + f\frac{\partial g}{\partial z}\hat{k} + g\frac{\partial f}{\partial z}\hat{k} \\
&= f\left(\frac{\partial g}{\partial x}\hat{i} + \frac{\partial g}{\partial y}\hat{j} + \frac{\partial g}{\partial z}\hat{k}\right) + g\left(\frac{\partial f}{\partial x}\hat{i} + \frac{\partial f}{\partial y}\hat{j} + \frac{\partial f}{\partial z}\hat{k}\right) \\
&= f\nabla g + g\nabla f \quad \text{QED.}
\end{aligned}
$$

$$
\begin{aligned}
\nabla\cdot(A\times B) &= \frac{\partial}{\partial x}(A_yB_z - A_zB_y) + \frac{\partial}{\partial y}(A_zB_x - A_xB_z) + \frac{\partial}{\partial z}(A_xB_y - B_yA_x) \\
&= A_y\frac{\partial B_z}{\partial x} + B_z\frac{\partial A_y}{\partial x} - \left(A_z\frac{\partial B_y}{\partial x} + B_y\frac{\partial A_z}{\partial x}\right) + A_z\frac{\partial B_x}{\partial y} + B_x\frac{\partial A_z}{\partial y} \\
&- \left(A_x\frac{\partial B_z}{\partial y} + B_z\frac{\partial A_x}{\partial y}\right) + A_x\frac{\partial B_y}{\partial z} + B_y\frac{\partial A_x}{\partial z} - \left(A_y\frac{\partial B_x}{\partial z} + B_x\frac{\partial A_y}{\partial z}\right) \\
&= B_z\left(\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y}\right) + B_y\left(\frac{\partial A_x}{\partial z} - \frac{\partial A_z}{\partial x}\right) + B_x\left(\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}\right) \\
&- A_z\left(\frac{\partial B_y}{\partial x} - \frac{\partial B_x}{\partial y}\right) + A_y\left(\frac{\partial B_x}{\partial z} - \frac{\partial B_z}{\partial x}\right) + A_x\left(\frac{\partial B_z}{\partial y} - \frac{\partial B_y}{\partial z}\right) \\
&= B\cdot(\nabla\times A) - A\cdot(\nabla\times B) \quad \text{QED.}
\end{aligned}
$$

$$
\begin{aligned}
\nabla\times(fA) &= f(\nabla\times A) - A\times(\nabla f) \\
&= \left(\frac{\partial fA_z}{\partial y} - \frac{\partial fA_y}{\partial z}\right)\hat{i} + \left(\frac{\partial fA_x}{\partial z} - \frac{\partial fA_z}{\partial x}\right)\hat{j} + \left(\frac{\partial fA_y}{\partial x} - \frac{\partial fA_x}{\partial y}\right)\hat{k} \\
&= \left(f\frac{\partial A_z}{\partial y} + A_z\frac{\partial f}{\partial y} - f\frac{\partial A_y}{\partial z} - A_y\frac{\partial f}{\partial z}\right)\hat{i} + \left(f\frac{\partial A_x}{\partial z} + A_x\frac{\partial f}{\partial z} - f\frac{\partial A_z}{\partial x} - A_z\frac{\partial f}{\partial x}\right)\hat{j} \\
&+ \left(A_y\frac{\partial f}{\partial x} + f\frac{\partial A_y}{\partial x} - A_x\frac{\partial f}{\partial y} - f\frac{\partial A_x}{\partial y}\right)\hat{k} \\
&= f\left(\left(\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}\right)\hat{i} + \left(\frac{\partial A_x}{\partial z} - \frac{\partial A_z}{\partial x}\right)\hat{j} + \left(\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y}\right)\hat{k}\right) \\
&+ \left(\left(A_z\frac{\partial f}{\partial y} - A_y\frac{\partial f}{\partial z}\right)\hat{i} + \left(A_x\frac{\partial f}{\partial z} - A_z\frac{\partial f}{\partial x}\right)\hat{j} + \left(A_y\frac{\partial f}{\partial x} - A_x\frac{\partial f}{\partial y}\right)\hat{k}\right) \\
&= f(\nabla\times A) - A\times(\nabla f)
\end{aligned}
$$