

85. We apply Eq. 25-41:

$$\begin{aligned}E_x &= -\frac{\partial V}{\partial x} = -2yz^2 \\E_y &= -\frac{\partial V}{\partial y} = -2xz^2 \\E_z &= -\frac{\partial V}{\partial z} = -4xyz\end{aligned}$$

which, at $(x, y, z) = (3, -2, 4)$, gives $(E_x, E_y, E_z) = (64, -96, 96)$ in SI units. The magnitude of the field is therefore

$$|\vec{E}| = \sqrt{E_x^2 + E_y^2 + E_z^2} = 150 \text{ V/m} = 150 \text{ N/C} .$$