Problem 1.

Show that $\partial\phi/\partial x^\mu$ is a covariant four-vector (ϕ is a scalar function of x, y, z, and t).

Hint: First determine (from Equation 3.8) how covariant four-vectors transform; then use $\partial\phi \ / \ \partial x^{\mu'} = (\partial\phi \ / \ \partial x^\nu)(\partial x^\nu \ / \ \partial x^{\mu'})$ transforms.

Solution