**Special Problem 4-2.1**

Two engineers are having a difference of opinion. One says the following static electric field cannot possibly exist.

\[ E(r) = \cos \theta \hat{a}_r + r^2 \hat{a}_\theta \]

The other engineer, however, says that this is in fact a valid static electric field—it violates no physical law.

Which engineer is correct? (Show explicitly why.)