

PHYS 703 - Directional Derivative.

The following table contains information about the potential $\Phi(\vec{x})$ and the electric field at given points in a charge-free volume. Estimate the

- (a) Potential at $\vec{x} = (1, 2, 2)$.
- (b) Electric field at $\vec{x} = (1, 2, 2)$.
- (c) Directional derivative of the potential at $\vec{x} = (1, 2, 2)$ along the direction of the vector $(1, 4, 1)$.

Table 1:

| (x,y,z) | Φ (V) | E_x (V/m) | E_y (V/m) | E_z (V/m) |
|-----------|------------|-------------|-------------|-------------|
| (1,1,1) | 0.086235 | -0.085947 | 0.000865 | 0.012195 |
| (1,2,1) | 0.084940 | -0.084657 | 0.001722 | 0.012012 |
| (2,1,1) | 0.171608 | -0.084657 | 0.001722 | 0.024269 |
| (1,1,2) | 0.074862 | -0.074613 | 0.000751 | 0.010587 |
| (2,2,2) | 0.146740 | -0.072389 | 0.002975 | 0.020752 |
| (3,2,2) | 0.218276 | -0.070563 | 0.004425 | 0.030869 |