

ENGI 4430 Advanced Calculus for Engineering

Tutorial Examples for Potential Functions

In each case, find the potential function for the vector field,
(or prove that no such potential function exists).

1. $\bar{\mathbf{F}} = (y + z + yz)\hat{\mathbf{i}} + (x(1 + z))\hat{\mathbf{j}} + (x(1 + y))\hat{\mathbf{k}}$

2. $\bar{\mathbf{F}} = \begin{bmatrix} e^y \\ xe^y + z^2 \\ 2yz \end{bmatrix}$

3. $\bar{\mathbf{F}} = \begin{bmatrix} -y \\ x \\ z \end{bmatrix}$

4. $\bar{\mathbf{F}} = \begin{bmatrix} (2x+1)z \sin y \\ x(x+1)z \cos y \\ x(x+1)\sin y \end{bmatrix}$

and the potential is zero on all coordinate planes.

5. $\bar{\mathbf{F}} = r(1 + \cos 2\theta)\hat{\mathbf{r}} - r \sin 2\theta\hat{\boldsymbol{\theta}}$ (spherical polar coordinates)

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