Conservative Vector Fields

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Conservative Vector Field Practice Problems

1. Is $\mathbf{F} = \langle 2xe^{xy} + x^2ye^{xy}, x^3e^{xy} + 2y \rangle$ a conservative vector field? If so find a potential function. If not, why not?

2. Is $\mathbf{F} = \langle x^2, x^2y, z + zx \rangle$ a conservative vector field? If so, find a potential function. If not, why not?

3. Is $\mathbf{F} = \langle 3x^2y, x^3 + y^3, 0 \rangle$ a conservative vector field? If so, find a potential function. If not, why not?

Challenge Problems

1. Prove that for any vector field $\mathbf{F}$, we have $\text{div}(\text{curl}(\mathbf{F})) = 0$.

2. Is $\mathbf{F} = \langle 2x\cos(y) - 2z^3, 3 + 2ye^z - x^2\sin(y), y^2e^z - 6xz^2 \rangle$ a conservative vector field? If so, find a potential function. If not, why not?

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