Identifying Gradient Fields and Exact Differentials

1. Determine whether each of the vector fields below is conservative.

a) $\mathbf{F} = \langle xe^x + y, x \rangle$

b) $\mathbf{F} = \langle xe^x + y, x + 2 \rangle$

c) $\mathbf{F} = \langle xe^x + y + x, x \rangle$

2. Show $(xe^x + y)\,dx + x\,dy$ is exact.

3. Compute the two dimensional curl of $\mathbf{F}$ for each of the vector fields below.

a) $\mathbf{F} = \langle x, xe^x + y \rangle$

b) $\mathbf{F} = \mathbf{i} + \mathbf{j}$

c) $\mathbf{F} = \langle xy^2, x^2y \rangle$

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