# Identifying Potential Functions

**1**. Show $\mathbf{F} = \langle 3x^2 + 6xy, 3x^2 + 6y \rangle$ is conservative and find the potential function $f$ such that $\mathbf{F} = \boldsymbol{\nabla} f$.

**2**. Let $\mathbf{F} = (x + xy^2)\,\mathbf{i} + (x^2y + 3y^2)\,\mathbf{j}$. Show $\mathbf{F}$ is a gradient field and find the potential function using both methods.

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