Vector fields, line integrals, and Green’s Theorem

Conservative vector fields - live examples

Example one:
Verify that $\mathbf{F}(x, y) = (3x^2y^2)i + (2x^3y)j$ is a conservative vector field in the plane, and find a potential function.
Example two:

Verify that $\mathbf{F}(x, y, z) = \left( \frac{x}{x^2 + y^2} \right) \mathbf{i} + \left( \frac{y}{x^2 + y^2} \right) \mathbf{j} + \mathbf{k}$ is a conservative vector field in space, and find a potential function.