GRADIENT FIELDS

Verify that each vector field below is a conservative or gradient vector field by showing that $\dfrac{\partial P}{\partial y} = \dfrac{\partial Q}{\partial x}$, and then find a potential function $z = f(x, y)$.

1. $\vec{F} = x\hat{i} + y\hat{j}$

2. $\vec{F} = y\hat{i} + x\hat{j}$

3. $\vec{F} = \cos(x)\hat{i} + \sin(y)\hat{j}$

4. $\vec{F} = (e^x + y^2)\hat{i} + (\cos y + 2xy)\hat{j}$

5. $\vec{F} = (3xy^2 + 5)\hat{i} + (3 + 3x^2 y)\hat{j}$