For each of the following vector fields, find a potential function if one exists, or argue that none exists.

- $\vec{\boldsymbol{F}} = (3x^2 + \tan y)\,\hat{\boldsymbol{x}} + (3y^2 + x\sec^2 y)\,\hat{\boldsymbol{y}}$
- $\vec{\boldsymbol{G}} = y\,\hat{\boldsymbol{x}} - x\,\hat{\boldsymbol{y}}$
- $\vec{\boldsymbol{H}} = (2xy + y^2 \sin z)\,\hat{\boldsymbol{x}} + (x^2 + z + 2xy \sin z)\,\hat{\boldsymbol{y}} + (y + z + xy^2 \cos z)\,\hat{\boldsymbol{z}}$
- $\vec{\boldsymbol{K}} = yz\,\hat{\boldsymbol{x}} + xz\,\hat{\boldsymbol{y}}$