

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

- $\vec{F} = (3x^2 + \tan y) \hat{x} + (3y^2 + x \sec^2 y) \hat{y}$

- $\vec{G} = y \hat{x} - x \hat{y}$

- $\vec{H} = (2xy + y^2 \sin z) \hat{x} + (x^2 + z + 2xy \sin z) \hat{y} + (y + z + xy^2 \cos z) \hat{z}$

- $\vec{K} = yz \hat{x} + xz \hat{y}$