

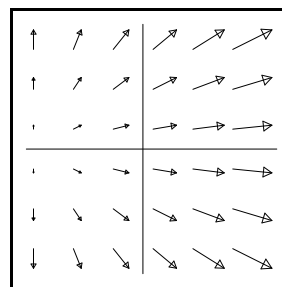
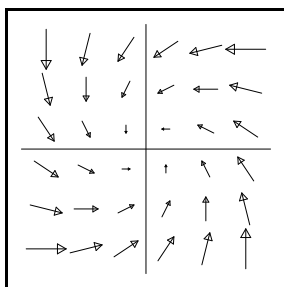
Skills check (not to turn in):

Compute the curl of each vector field below. Without doing any further computation, decide whether each vector field is conservative. *Use the Murder Mystery Method to check your work!*

- (a) $\vec{F} = (3x^2 + \tan y) \hat{i} + (3y^2 + x \sec^2 y) \hat{j}$
- (b) $\vec{G} = y \hat{i} - x \hat{j}$
- (c) $\vec{H} = (2xy + y^2 \sin z) \hat{i} + (x^2 + z + 2xy \sin z) \hat{j} + (y + z + xy^2 \cos z) \hat{k}$
- (d) $\vec{K} = yz \hat{i} + xz \hat{j}$

Assigned:

1. Decide whether the vector fields below have a nonzero curl at the origin. In each case, the vector field is shown in the xy -plane; assume it has no z -component and is independent of z .



2. A smooth vector field \vec{G} satisfies

$$(\vec{\nabla} \times \vec{G})|_{(0,0,0)} = 2\hat{i} - 3\hat{j} + 5\hat{k}$$

Estimate the circulation $\oint \vec{G} \cdot d\vec{r}$ around a circle of radius 0.01 centered at the origin in each of the following planes:

- (a) xy -plane, oriented counterclockwise when viewed from the positive z -axis.
- (b) yz -plane, oriented counterclockwise when viewed from the positive x -axis.
- (c) xz -plane, oriented counterclockwise when viewed from the positive y -axis.