MTH 255 **HW #9** Winter 2003

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. *In a previous activity, you determined whether each of the following vector fields was conservative using the Murder Mystery Method.*

(a) $\vec{\boldsymbol{F}} = (3x^2 + \tan y)\,\hat{\boldsymbol{\imath}} + (3y^2 + x\sec^2 y)\,\hat{\boldsymbol{\jmath}}$

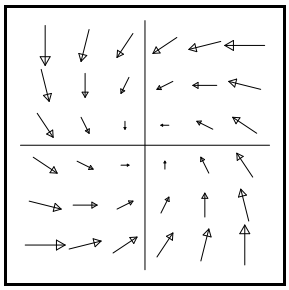
(b) $\vec{\boldsymbol{G}} = y\,\hat{\boldsymbol{\imath}} - x\,\hat{\boldsymbol{\jmath}}$

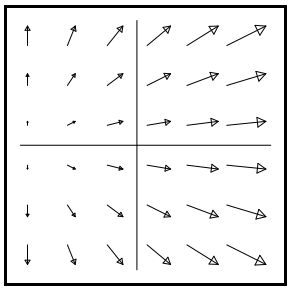
(c) $\vec{\boldsymbol{H}} = (2xy + y^2\sin z)\,\hat{\boldsymbol{\imath}} + (x^2 + z + 2xy\sin z)\,\hat{\boldsymbol{\jmath}} + (y + z + xy^2\cos z)\,\hat{\boldsymbol{k}}$

(d) $\vec{\boldsymbol{K}} = yz\,\hat{\boldsymbol{\imath}} + xz\,\hat{\boldsymbol{\jmath}}$

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 $\vec{\boldsymbol{G}}$ satisfies

$$\left(\vec{\nabla} \times \vec{\boldsymbol{G}}\right)\Big|_{(0,0,0)} = 2\,\hat{\boldsymbol{\imath}} - 3\,\hat{\boldsymbol{\jmath}} + 5\,\hat{\boldsymbol{k}}$$

Estimate the circulation $\oint \vec{\boldsymbol{G}} \cdot d\vec{\boldsymbol{r}}$ 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.