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

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 $\mathbf{G}$ satisfies

$$\left(\nabla \times \mathbf{G}\right)_{(0,0,0)} = 2 \mathbf{i} - 3 \mathbf{j} + 5 \mathbf{k}$$

Estimate the circulation $\int \mathbf{G} \cdot d\mathbf{r}$ 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.