

Choose a vector field  $\vec{F}$  from the first column below. Choose a small loop  $C$  (that is, a simple, closed, positively-oriented curve) which does **not** go around the origin.

- Is  $\oint \vec{F} \cdot d\hat{r}$  positive, negative, or zero?
- Will a paddlewheel spin if placed inside your loop, and, if so, which way?
- Do you think  $\nabla \times \vec{F}$  is zero or nonzero inside your loop?  
*Explain.*
- Compute  $\nabla \times \vec{F}$ . Did you guess right? *Explain.*
- Is  $\oint \vec{F} \cdot \hat{n} ds$  positive, negative, or zero? ( $\hat{n}$  is the *outward* pointing normal vector to  $C$ .)
- Is the net flow outwards across your loop positive, negative, or zero?
- Do you think  $\nabla \cdot \vec{F}$  is zero or nonzero inside your loop? *Explain.*
- Compute  $\nabla \cdot \vec{F}$ . Did you guess right? *Explain.*
- Repeat the above steps for vector fields  $\vec{G}$  and  $\vec{H}$  chosen from the second and third columns.

