

1. Let  $\vec{F} = 3s \hat{s}$ .

- Make a rough sketch of  $\vec{F}$ .
- Suppose you have a paddlewheel and dipped it into a pool that flowed according to  $\vec{F}$ . Would the paddlewheel spin?
- This is related to the line integral of  $\vec{F}$  around a closed path. Do you think the line integral would be positive negative or zero?

2. Let  $\vec{G} = \frac{1}{s} \hat{\phi}$ .

- Make a rough sketch of  $\vec{G}$ .
- Suppose you have a paddlewheel and dipped it into a pool that flowed according to  $\vec{G}$ . Would the paddlewheel spin?
- This is related to the line integral of  $\vec{G}$  around a closed path. Do you think the line integral would be positive negative or zero?

3. The trait highlighted in #1 and #2 can be quantified by *curl*. In two dimensions, the curl of  $F_s \hat{s} + F_\phi \hat{\phi}$  is  $(\frac{1}{s} \frac{\partial}{\partial s} (s F_\phi) - \frac{\partial}{\partial \phi} F_s) \hat{z}$ .

- Compute the curl for both  $\vec{F}$  and  $\vec{G}$ .