

Math 210 (Lesieutre)  
Quiz 12  
April 21, 2017

Name: \_\_\_\_\_

**Problem 1.** Suppose you are trying to find the flux of  $\nabla \times \mathbf{F}$  across the surface  $S$  sketched below, with an outward normal vector.



a) You decide to use Stokes' theorem instead, to convert the flux integral into two circulation integrals for the field  $\mathbf{F}$ . How should you orient the curves  $C_{\text{left}}$  and  $C_{\text{right}}$ ? Indicate your answer by drawing arrows in the positive direction at the two marked points.

According to the right-hand rule, we want to go clockwise around each of these. So you should draw two arrows pointing to the left.

b) You find that  $\oint_{C_{\text{left}}} \mathbf{F} \cdot d\mathbf{r} = 2$  and  $\oint_{C_{\text{right}}} \mathbf{F} \cdot d\mathbf{r} = 5$ . What is the value of  $\iint_S (\nabla \times \mathbf{F}) \cdot \mathbf{n} \, dS$ ?