

Math 14  
Winter 2009  
Monday, February 9: Additional Homework Problems

For these problems, we suppose that  $D$  is an  $x$ -simple region in the  $xy$ -plane. We also let  $\gamma$  be the boundary of  $D$ , oriented counterclockwise, and let  $P(x, y)$  be a continuously differentiable function from  $\mathbb{R}^2$  to  $\mathbb{R}$ . We assume  $\gamma$  is piecewise smooth.

(1.) Give equations to define, and sketch, such a region  $D$ . You may have to introduce symbols to denote points, functions, and so forth that are relevant to defining  $D$ .

(2.) Find an expression for

$$\iint_D \frac{\partial P}{\partial x} dA$$

as a single integral. The points, functions, and so forth you introduced in (1) may appear here.

(3.) Compare

$$\iint_D \frac{\partial P}{\partial x} dA$$

to  $\int_{\gamma} \langle P, 0 \rangle \cdot \vec{n} ds$  and to  $\int_{\gamma} \langle 0, P \rangle \cdot \vec{T} ds$ .