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1. Consider the rectangle in the first quadrant of the  $xy$ -plane as in the figure with thick black lines.
  - Label the bottom horizontal edge of the rectangle  $y = c$ .
  - Label the sides of the rectangle  $\Delta x$  and  $\Delta y$ .
  - What is the area of the rectangle?
  - There are also 2 rectangles whose base is the  $x$ -axis, the larger of which contains both the smaller and the original rectangle. Express the area of the original rectangle as the difference between the areas of these 2 rectangles.
2. On the grid below, draw any simple, closed, piecewise smooth curve  $C$ , all of whose segments  $C_i$  are parallel either to the  $x$ -axis or to the  $y$ -axis. Your curve should **not** be a rectangle. Pick an origin and label it, and assume that each square is a unit square.

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- Compute the area of the region  $D$  inside  $C$  by counting the number of squares inside  $C$ .
  - Evaluate the line integral  $\oint_C y \hat{\mathbf{x}} \cdot d\vec{r}$  by noticing that along each segment either  $x$  or  $y$  is constant, so that the integral is equal to  $\sum_{C_i} y \Delta x$ .

*Can you relate this to Problem 1?*
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- Are your answers to the preceding two calculations the same?
  - Would any of your answers change if you replaced  $y \hat{\mathbf{x}}$  by  $x \hat{\mathbf{y}}$  in part (b)?