You have 10 minutes to complete the quiz. Calculators are not permitted, and remember to show your calculations and explain your reasoning in order to receive full credit.

1. If \( \mathbf{F}(x, y) = \langle ye^x, 2e^x \rangle \), find the work that the force field \( \mathbf{F} \) does on a goat that runs once \textbf{counterclockwise} around the rectangle with vertices at (0,0), (3,0), (3,4), and (0,4).

Use Green’s Theorem:

\[
\int_{C} \mathbf{F} \cdot d\mathbf{r} = \int_{C} P \, dx + Q \, dy
\]

\[
= \iint_{D} \frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \, dA
\]

\[
= \iint_{D} 2e^x - e^x \, dA
\]

\[
= \int_{x=0}^{3} \int_{y=0}^{4} e^x \, dy \, dx
\]

\[
= \int_{x=0}^{3} 4e^x \, dx
\]

\[
= 4e^3 - 4.
\]