Quiz 12; Wednesday, April 20
MATH 53 with Professor Stankova
Section 109; 11-12
GSI: Eric Hallman

Student name:

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 $\mathbf{F}(x, y) = \langle y, -x \rangle$, find the work that the force field $\mathbf{F}$ does on a goat running once **clockwise** around the unit circle.

   Set $x(t) = \cos t$, $y(t) = -\sin t$ (note the negative sign!) Then

$$\begin{aligned}
\int_C \mathbf{F} \cdot d\mathbf{r} &= \int_{t=0}^{2\pi} \langle y, -x \rangle \cdot \mathbf{r}'(t)\, dt \\
&= \int_{t=0}^{2\pi} \langle -\sin t, -\cos t \rangle \cdot \langle -\sin t, -\cos t \rangle\, dt \\
&= \int_{t=0}^{2\pi} \sin^2 t + \cos^2 t\, dt \\
&= \int_{t=0}^{2\pi} 1\, dt \\
&= 2\pi.
\end{aligned}$$