Name ________________________________

- No calculators allowed.
- Show sufficient work to justify each answer.
- You have 15 minutes for this quiz.

1. (2 points) Sketch the vector field $\mathbf{F}(x, y) = -y\mathbf{j}$

2. (4 points) Let $E$ be the trapezoid with vertices $(8, 0), (12, 0), (0, 8)$ and $(0, 12)$. Using the change of variables $u = x - y, v = x + y$ change $\iint_E (x^2 - y^2)\,dA$ into an integral that is easier to evaluate.

(Do Not Evaluate)
(Simplify)

$$\begin{vmatrix} 1 & -1 \\ 1 & 1 \end{vmatrix} = 2$$

So, $\frac{\partial(x, y)}{\partial(u, v)} = \frac{1}{2}$
3. (4 points) Let \( E \) be the region bounded by \( 16x^2 + \frac{y^2}{9} = 2 \).

Find an appropriate change of variables and change \( \iint_E e^{(16x^2 + \frac{y^2}{9})} \, dA \) into an integral that is easier to evaluate.

(Do Not Evaluate)

(Simplify)

Let \( 16x^2 = u^2 \) \( \Rightarrow x = \frac{u}{4} \)

\[ \frac{y^2}{9} = v^2 \Rightarrow y = 3v \]

So, \( u^2 + v^2 = 2 \)

Circle in \( uv \)-plane of radius \( \sqrt{2} \)

\[ \frac{3}{4} \int_{0}^{\pi} \int_{0}^{\sqrt{2}} e^r \, rdr \, d\theta \]