For the next several problems we will be working with the function $f(x, y) = xy^3$

- Evaluate the line integral $\int_C f(x, y) ds$ over the curve $C(t) = (4 \sin t, 4 \cos t, 3t)$
  (If you are confused how to start, here are some steps to try)
  - Write out $f(x(t))$ so that $f$ is a function of only $t$
  - Compute $C'(t)$
  - Setup the line integral
  - Evaluate the line integral

- Redo the previous problem using the curve assigned by your TA.

Now rather than $f$ being a scalar function, let $g$ be a vector field given by $g(x, y) = (y, -x)$.

- Compute $\mathbf{g}_C$ for a circle with radius 1 centered at the origin using the line integral. (Again, here are some steps to follow if you don’t know where to start).
  - Create a parametric equation for the curve $C$
  - Compute $C'(t)$
– Write out the equation of the vector field as you move along the curve.
– Evaluate the line integral

• Repeat the previous problem using Green’s theorem.

• Compute the area inside the quadrilateral with vertices (2, 0), (1, 2), (1, 1), and (−1, 1). (Try to compute using Green’s Theorem.)

• Find the area between the ellipse \( \frac{x^2}{9} + \frac{y^2}{4} = 1 \) and the circle \( x^2 + y^2 = 25 \)