1. Let $f(x, y, z) = xy^3$. Evaluate the line integral $\int_C f(x, y) ds$ over the curve $C(t) = (4 \sin t, 4 \cos t, 3t)$ where $0 \leq t \leq \pi/2$. (If you are confused how to start, here are some steps to try)

- What are the start and end points of the path $C(t)$?
- Write out $f(C(t))$ so that $f$ is a function of only $t$?
- Compute $C'(t)$
- Setup the line integral (is it a vector or scalar line integral?)
- Evaluate the line integral

2. Let $G(x, y) = (y, -x)$ Compute $\int_C g ds$ for a circle with radius 1 centered at the origin using the line integral. (Hint: use polar coordinates for your parameterization). (Again, here are some steps to follow if you don’t know where to start).

- sketch a graph of the vector field $G(x, y)$.
- Create a parametric equation for the curve $C$
- Compute $C'(t)$
- Write an out the equation of the vector field as you move along the curve.
- Evaluate the line integral
3. Evaluate $\oint_C (x^2 - y)dx + (x - y^2)dy$ where $C$ is the counterclockwise path around the region bounded by $y = x^2$ and $y = 6x + 7$

4. Let $C$ be the path given as $(t^2, t^2, 2t)$ with $0 \leq t \leq 1$. Define $f(x, y, z) = \frac{y + z}{x + z}$, and compute $\int_C fdS$

5. Let $F(x, y, z) = (x + y, y + z, x + z)$ be a vector valued function.
   - Compute the gradient of this vector field.
   - Compute the divergence of the vector field.
   - Compute the curl of the vector field.