1. If $\Omega$ =the triangle whose vertices are:$(0,0),(1,0),(1,1)$ and $\gamma$ the boundary of $\Omega$.

Set $M(x,y) = -ye^x$ and $N(x,y) = xe^y$

Verify Green’s Theorem

2. Find $f(x,y)$ such that $\nabla f = F$ for each of the following:

a.) $F(x,y,z) = (yz, xz, xy)$

b.) $F(x,y,z) = ((\sec(x))^2, z, y + 2z)$

3.) For $F(x,y,z) = y\sin(z)i + x\sin(z)j + xy\cos(z)k$

a.) Find $\nabla \cdot F$

b.) Find $\nabla \times F$

4.) Evaluate $\int_C (x-y)dx + (x+y)dy$ where $C$ is the unit square with a vertices at $(0,0), (0,1), (1,0), (1,1)$

5.) Find the area of a fence whose base is $y = x\sqrt{x}$ from $(0,0)$ to $(1,1)$ and whose height is given by the curve $x^3 - y^2 + 27$.

6.) For $F = (3y - 2x)i + (x^2 + y)j$, find the value of $\int_C F \cdot dr$ where $C$ is the portion of the parabola $y = x^2$, directed from $(-1,1)$ to the origin.
7a.) Let \( C \) be the portion of \( x^\frac{3}{2} + y^\frac{3}{2} = 1 \) from \((1,0)\) to \((0,1)\), which can parameterized by
\[
x = (\cos(t))^3 \quad \text{and} \quad y = (\sin(t))^3
\]
as \( t \) increases form 0 to \( \pi/2 \).
Evaluate \( \int_C (y \cos(xy) - 1)\,dx + (1 + x \cos(xy))\,dy \).

7b.) Let \( C \) be the curve which can parameterized by \( x = (te^{(1-t)}) \) and \( y = (\arcsin(t)) \)
as \( t \) increases form 0 to 1.
Evaluate \( \int_C e^x (\sin(y)\,dx + \cos(y)\,dy) \).

8.) Let \( C \) be the triangle with vertices \{\((0, 0), (2, 0), (2, 2)\)\}.
Evaluate \( \int_C (e^{2x} - y)\,dx + (2x + y\sqrt{y})\,dy \).

9.) p. 1132 ex 1 and 5