HOMEWORK 10 **DUE: Wed., Mar. 10** **NAME:**

DIRECTIONS:

- **STAPLE** this page to the front of your homework (don't forget your name!).
- Show all work, clearly and in order **You will lose points if you work is not in order**.
- When required, **do not forget the units**!
- Circle your final answers. **You will lose points if you do not circle your answers**.

Question	Points	Score
1	2	
2	1	
3	2	
4	2	
5	3	
Total	10	

Problem 1: (2 points) Verify Green's theorem for $\mathbf{F} = -x^2y\mathbf{i} + xy^2\mathbf{j}$, where D is the disk $x^2 + y^2 \leq 4$.

Problem 2: (1 point) Let $P(x, y) = -y/\left(x^2 + y^2\right)$ and $Q = x/\left(x^2 + y^2\right)$. Assuming D is the unit disk, investigate why Green's theorem fails for this P and Q.

Problem 3: (2 points) Use Green's theorem to find the area between the ellipse $x^2/9 + y^2/4 = 1$ and the circle $x^2 + y^2 = 25$.

Problem 4: (2 points) Verify Stokes's theorem for the surface defined by $x^2 + y^2 + 5z = 1$ where $z \geq 0$, oriented by an upward normal for the vector field

$$\mathbf{F} = \left(xz, yz, x^2 + y^2\right).$$

Problem 5: (3 points) Let S be the surface defined by $y = 10 - x^2 - z^2$ with $y \geq 1$, oriented with a rightward pointing normal. Let

$$\mathbf{F} = \left(2xyz + 5z, e^x \cos(yz), x^2y\right).$$

Determine

$$\int\int_S \nabla \times \mathbf{F} \cdot d\mathbf{S}.$$

(Hint: You will need to use an indirect approach.)