HOMEWORK 9 **DUE: Fri., Mar. 5** **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	2	
6	1	
Total	10	

Problem 1: (2 points) Calculate the surface area of the section of the cone given by $z^2 = x^2 + y^2$ where $0 \leq z \leq 2$ using surface area integrals.

Problem 2: (1 point) Is the surface discussed in problem 1, regular at all points (x_0, y_0, z_0) in its domain? Justify your answer.

Problem 3: (2 points) Suppose S is the graph of the portion of the paraboloid $z = 4 - x^2 - y^2$ where (x, y) varies throughout the disk $D = \{(x, y) \in \mathbb{R}^2 | x^2 + y^2 \leq 4\}$. Calculate

$$\int\int_{\mathbf{\Psi}} (4 - z) dS,$$

where $\mathbf{\Psi}$ is a parametrization of the surface of the graph.

Problem 4: (2 points) Find

$$\int\int_{S} x^2 dS,$$

where S is the surface of the cube $[-2, 2] \times [-2, -2] \times [-2, 2]$.

Problem 5: (2 points) Find the flux of the vector field $\mathbf{F} = -y\mathbf{i} + x\mathbf{j} - \mathbf{k}$ across the upper hemisphere $x^2 + y^2 + z^2 = a^2$, where $z \geq 0$. Orient the hemisphere with an upward-pointing normal.

Problem 6: (1 point) Find the Gauss curvature of the hyperbolic paraboloid

$$z = \frac{x^2}{a^2} - \frac{y^2}{b^2}.$$