Name: Date:

Worksheet 11

1. Compute the surface integral $\iint_S (x+y+z)\, dS$, where S is a surface given by $\mathbf{r}(u,v) = \langle u+v, u-v, 1+2u+v \rangle$ and $0 \le u \le 2,\ 0 \le v \le 1$.

2. Let S be the portion of the graph $z = 4 - 2x^2 - 3y^2$ that lies over the region in the xy-plane bounded by $x = 0,\ y = 0$, and $x + y = 1$. Write the integral that computes $\iint_S \left(x^2 + y^2 + z\right)\, dS$.

3. Compute $\iint_S \mathbf{F} \cdot d\mathbf{S}$, where $\mathbf{F} = y\mathbf{i} - x\mathbf{j} + z\mathbf{k}$ and S is a surface given by

$$x = 2u, \quad y = 2v, \quad z = 5 - u^2 - v^2,$$

where $u^2 + v^2 \le 1$. S has downward orientation.

4. Compute the flux of the vector field $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ over the part of the cylinder $x^2 + y^2 = 4$ that lies between the planes $z = 0$ and $z = 2$ with normal pointing away from the origin.

5. Find the flux of the vector field $\mathbf{F}(x,y,z) = \langle 0, z, 1 \rangle$ across the hemi-sphere $x^2 + y^2 + z^2 = 4$, $z \ge 0$ with orientation away from the origin.