Name _____

Homework 24
Sections 19.1 & 19.2

1. (5) Let S be the part of the graph of $z = 12 - x^2 - y^2$ with $z \geq 0$. Let $\vec{F}$ be the vector field $\vec{F}(x, y, z) = \left(\frac{1}{2}x\right)\vec{i} + \left(x + \frac{1}{2}y\right)\vec{j} + (12 - z)(x^2 + y^2)\vec{k}$, find the flux of $\vec{F}$ through S, where S has the outward orientation.

2. (3ea) Consider the vector field $\vec{F}(x,y,z) = xz\vec{i} + 2y\vec{k}$. Set up simplified (i.e. compute the dot products) iterated integrals to represent the flux of $\vec{F}$ through the hemisphere $x^2 + y^2 + z^2 = 9$, $z \geq 0$, oriented upward using

   (a) Cartesian coordinates

   (b) Spherical coordinates

3. (5) Compute the flux of $\vec{F} = xz\vec{i} + 2y\vec{k}$ through the hemisphere $x^2 + y^2 + z^2 = 9$, $z \geq 0$, oriented upward using one of your integrals from the previous problem.

4. (5) Find the flux of $\vec{G} = ((x-4)z)\,\vec{i} + xy\vec{j} - x^3z^2\vec{k}$ through an open cylinder of height 5 and radius 3 centered along the z-axis, oriented away from the z-axis.