Name _____

Homework 16
Sections 19.1 & 19.2

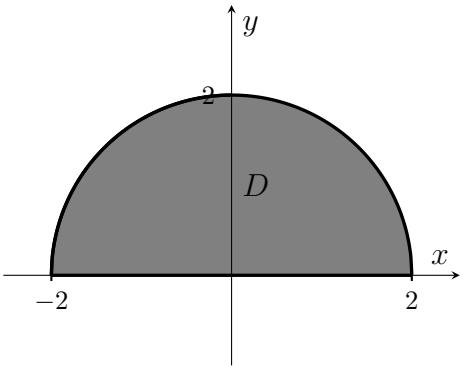
1. (3ea) Consider the vector field $\vec{G} = (4+x)\vec{i} - 4xy\vec{j} + (x^2 - z)\vec{k}$.

   (a) Determine the flux of $\vec{G}$ through the disk, D, of radius 5 in the $x = 2$ plane, centered at $(2, 1, 7)$, oriented toward the yz-plane.

   (b) Determine the flux of $\vec{G}$ through the rectangle, R, with vertices $(-1, 1, 2)$ $(-1, 3, 2)$ $(5, 3, 2)$ and $(5, 1, 2)$, oriented upward.

2. (5) Consider the surface S which is the portion of the graph of $f(x, y) = 5 + x^2 + 6y$, oriented upward, which lies above the rectangle $1 \leq x \leq 4$, $-2 \leq y \leq 3$, in the xy-plane. Determine the flux of the vector field $\vec{F}(x, y, z) = xy\vec{i} + (7 - z)\vec{j} + (12 - 6x^2)\vec{k}$ through S.

3. (5) Let $\vec{F}$ be the vector field given by $\vec{F} = (4-y)\vec{i}+(7-x)\vec{j}+\left(\frac{z}{x}\right)\vec{k}$. Compute $\int_S \vec{F}\cdot d\vec{A}$, where S is the portion of $z = x^2 - xy$, oriented upward, over the half-disk D, shown below.



4. (5) Let S be the portion of $z = x^2 - y$ which lies above the region R shown below. Determine the flux of $\vec{F}(x, y, z) = (x + 1)\vec{i} + (2z + 2x + y)\vec{j} + (x^2 - z + 3)\vec{k}$ through S, given that S is oriented upward.