

Name \_\_\_\_\_

Homework 17

Section 19.2

1. (5) Find the flux of  $\vec{F} = ((x - 4)z)\vec{i} + 3xy\vec{j} - x^3z^2\vec{k}$  out of the open cylinder  $x^2 + y^2 = 4$ , extending 6 units from the  $xy$ -plane in the negative  $z$ -direction.

2. (5) Consider the region  $R$ , lying in the  $xy$ -plane, which is bounded between the graphs of  $y = 3x + 2$  and  $y = x^2 - 2$ . Determine  $\int_S \vec{G} \cdot d\vec{A}$ , where  $S$  is the portion of  $z = x^2 + y^2 - x$  lying over  $R$ , oriented downward, and  $\vec{G} = (y - x)\vec{i} - (x + y)\vec{j} + (3x - 2z - y)\vec{k}$ .

3. (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, including limits of integration, to represent the flux of  $\vec{F}$  through the surface of  $x^2 + y^2 + z^2 = 9$  with  $z \geq 0$ , oriented upward by

(a) considering  $S$  to be the appropriate portion of a sphere.

(b) considering  $S$  to be the portion of a graph of a function.

4. (5) Let  $S$  be the “silo” which is comprised of the disk  $x^2 + y^2 \leq 4$  in the  $z = -5$  plane, the cylinder  $x^2 + y^2 = 4$  from  $z = -5$  to  $z = 0$ , and the hemisphere  $z = \sqrt{4 - x^2 - y^2}$ . Determine the flux of  $\vec{F} = (x^2 - x)\vec{i} + (10y - 2xy + 3yz^2)\vec{j} + (xy - z^3 - 3z)\vec{k}$  out of  $S$ .

Draw a Thanksgiving picture.