

## Problem set – Week 11

### SURFACE AREAS, SURFACE INTEGRALS AND COMPUTING THE FLUX THROUGH A SURFACE

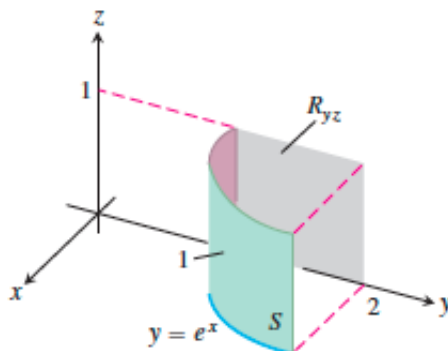
1. Compute the surface area of the surfaces described in exercises 1 to 3 in problem set 9.
2. Integrate the given function over the given surface.
  - (a)  $f(x, y, z) = z - x$  over the cone from Ex. 1, PS 9.
  - (b)  $f(x, y, z) = yz$  over the spherical cap from Ex. 2, PS 9.
  - (c)  $f(x, y, z) = x + y + z$  over the surface of the cube cut from the first octant by the planes  $x = a$ ,  $y = a$ ,  $z = a$ .

3. Find the outward flux of the field

$$\vec{F}(x, y) = \begin{pmatrix} 2xy \\ 2yz \\ 2xz \end{pmatrix}$$

across the surface described in Ex. 2(c).

4. Consider the surface that is the green portion of cylinder depicted below. Let  $\vec{n}$  be the normal unit vector pointing away from the  $yz$ -plane.



Determine the flux of the field

$$\vec{F}(x, y, z) = \begin{pmatrix} -2 \\ 2y \\ z \end{pmatrix}$$

across  $S$  in direction of  $\vec{n}$ .