1. Do the following book problems (this would have been the homework for the final week)
   Section 17.6 3,7,11
   Section 17.7 3,7,11,19

2. Write the triple integral over S of $f(x, y, z)$ if S is the tetrahedron with vertices $(0, 0, 0), (3, 2, 0), (0, 3, 0), (0, 0, 2)$

3. Find the volume of the solid bounded by the cylinders $x^2 = y$ and $z^2 = y$ and the plane $y = 1$

4. Find $\int\int\int_S xy^2z^3\ dx\ dy\ dz$ where S is the solid bounded by the surface $z = xy$ and the planes $y = x, x = 1, z = 0$

5. Find $\int\int\int_S xyz$ where S is the region defined by $x \geq 0,\ y \geq 0, z \geq 0,\ x^2 + y^2 + z^2 \leq 1$

6. Assume we have a sphere of radius a, centered at the origin. If we look at a wedge of the sphere defined by the section bounded by the half-planes $\theta = \alpha$ and $\theta = -\alpha$, find the x-coordinate of the center of mass and the average distance from the z-axis

7. Assuming that the required partial derivatives exists and are continuous, show that

   (a) div curl $\mathbf{F} = 0$

   (b) curl grad $f = \mathbf{0}$

   (c) div$(f\mathbf{F})$ = (f)(div $\mathbf{F}$) + (grad f)$\cdot\mathbf{F}$

   (d) curl$(f\mathbf{F})$ = (f)(curl $\mathbf{F}$) + (grad f) $\times$ $\mathbf{F}$

8. Calculate the line integral of the vector field $\mathbf{F} = (x^2 - 2xy)\mathbf{i} + (y^2 - 2xy)\mathbf{j}$ from (-1,1) to (1,1) along the parabola $y = x^2$

9. Calculate the line integral of the vector field $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + (xz - y)\mathbf{k}$ along the curve $\alpha(t) = t^2\mathbf{i} + 2t\mathbf{j} + 4t^3\mathbf{k} \quad 0 \leq t \leq 1$

10. Calculate $\int_C y\ dx + z\ dy + x\ dz$ where C is the curve of intersection between the two surfaces $x + y = 2$ and $x^2 + y^2 + z^2 = 2(x + y)$. The curve is traversed once, in a clockwise direction when viewed from the origin.

11. Is $\mathbf{F}$ conservative?

    (a) $\mathbf{F} = (x, y)$

    (b) $\mathbf{F} = (siny - ysinx + x, cosx + xcosy + y)$

    (c) $\mathbf{F} = (y^2cosx + z^3, 2ysinx - 4, 3xz^2 + 2)$

    (d) $\mathbf{F} = (-e^{-x}lny, e^{-x}y^{-1})$

12. Evaluate $\int_C \sqrt{y}\ dx + \sqrt{x}\ dy$ where C is the closed curve formed by $y = 0$, $x = 2$, and $y = \frac{x^2}{2}$

13. Find the work done by $\mathbf{F} = (x^2+y^2)\mathbf{i} - 2xy\mathbf{j}$ in moving a body counterclockwise around the unit square with verticies (0,0), (1,0), (0,1), (1,1)

14. Evaluate the surface integral $\int\int_G 2y^2 + z dS$ where G is the surface of the cube $0 \leq x \leq 1,\ 0 \leq y \leq 1,\ 0 \leq z \leq 1$

15. Find the mass of the surface $z = 1 - \frac{1}{2}(x^2 + y^2)$ over $0 \leq x \leq 1,\ 0 \leq y \leq 1,\ z = 0$, if $\delta(x, y, z) = kxy$ for some constant k

16. We are looking at a region defined by the top part of the sphere $x^2 + y^2 + z^2 = 25$, cut off by the plane $z = 3$. What is the flux of the vector field $\mathbf{F} = (xz, yz, 1)$

17. Evaluate $\int\int_S curl\mathbf{F} \cdot \mathbf{n} dS$ where $\mathbf{F} = y^2\mathbf{i} + xy\mathbf{j} + xz\mathbf{k}$ and S is the hemisphere $x^2 + y^2 + z^2 = 1,\ z \geq 0$ with a upward pointing normal component