1. Evaluate the iterated integral

$$\int_0^{\pi} \int_0^{x} \sin(x)\, dy dx$$

2. Find the volume of the solid bound between $z = 0$ and $z = x + 2y$ over

$$R: \begin{array}{ll} x = 0 & y = 0 \\ x = 2 & y = x^2 \end{array}$$

3. Evaluate the following iterated integral by changing it from a Type I to a type II or vice versa:

$$\int_0^{\pi} \int_x^{\pi} \frac{\sin(y)}{y} dy dx$$

4. Evaluate the following iterated integral by changing it from a Type I to a Type II or vice versa:

$$\int_0^{1} \int_0^{1-x} \sec^2\left(2y - y^2\right) dy dx$$

5. Find the mass of the cylinder between $z = 0$ and $z = 1$ over the interior of the unit circle if its mass density is given by $\rho(x, y, z) = |y|$.

6. What is the volume of the polyhedron with vertices $(0,0,0)$, $(1,0,0)$, $(0,1,0)$, $(1,1,0)$, $(0,0,1)$, and $(0,1,1)$?

7. Suppose that the probability density for the time required to complete the "A" component of an exam is given by

$$p_A(x) = \begin{cases} 0 & if \quad x < 0 \\ \frac{1}{30} e^{-x/30} & if \quad x \geq 0 \end{cases}$$

(time in minutes). Suppose the event of completing the "B" component of the exam has the same density. If the completion of the A and B sections are independent events, then what is the probability that a student will complete the entire exam (i.e., both sections) in less than an hour?

8. Evaluate by converting to polar coordinates:

$$\int_0^{1} \int_x^{\sqrt{2-x^2}} dy dx$$

9. Evaluate by converting to polar coordinates

$$\int_0^1 \int_{1-x}^{\sqrt{1-x^2}} \frac{dydx}{\left(x^2+y^2\right)^{3/2}}$$

10. Use the coordinate transformation $T(u,v) = \langle u, \sqrt{v} \rangle$ to evaluate

$$\int_0^{\sqrt{\pi}} \int_0^{\sqrt{\pi}} y \sin\left(y^2\right) dydx$$

11. Use the coordinate transformation $T(u,v) = \langle u, ve^{-u} \rangle$ to evaluate

$$\int_0^1 \int_0^1 ye^x dydx$$

12. Suppose $\rho(x,y,z) = xz(1-y)$ coulombs per cubic meter is the charge density of a "charge cloud" contained in the "box" given by $[0,1] \times [0,1] \times [0,1]$. What is the total charge inside the box?

13. Evaluate by converting to spherical coordinates

$$\int_{-1}^1 \int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{2-x^2-y^2}} \frac{dzdydz}{z\sqrt{x^2+y^2+z^2}}$$

14. What is the mass of the cone $x^2+y^2=z^2$ between $z=0$ and $z=1$ if the mass density is constant at $\mu = 4$ kg per cubic meter?