1. Compute \( \int_0^2 \int_y^2 (x + y) \, dx \, dy \).
   - a. 2
   - b. 4
   - c. 6
   - d. 8
   - e. 10

2. Compute \( \iiint_2 2xy \, dV \) over the solid region \( R \) given by \( x^2 \leq y \leq x \) and \( 0 \leq z \leq x \).
   - a. \( \frac{1}{70} \)
   - b. \( \frac{1}{35} \)
   - c. \( \frac{2}{35} \)
   - d. \( \frac{4}{35} \)
   - e. None of these.
3. Compute \( \iint_{R} e^{x^2+y^2} \, dA \) over the region \( R \) in the 1st quadrant between the circles \( x^2 + y^2 = 4 \) and \( x^2 + y^2 = 9 \).
   a. \( \frac{\pi}{2} e^5 \)
   b. \( \frac{\pi}{4} (e^3 - e^2) \)
   c. \( \frac{\pi}{2} (e^3 - e^2) \)
   d. \( \frac{\pi}{4} (e^9 - e^4) \)
   e. \( \frac{\pi}{2} (e^9 - e^4) \)

4. Compute \( \iint_{0}^{2} \int_{0}^{2} e^{-x^2} \, dx \, dy \).
   a. \( \frac{1}{2} (1 - e^{-4}) \)
   b. \( \frac{1}{4} (1 - e^{-4}) \)
   c. \( \frac{1}{4} (e^{-4} - 1) \)
   d. \( \frac{1}{4} e^{-4} \)
   e. \( -\frac{1}{2} e^{-4} \)
5. A cupcake has its base on the $xy$-plane. Its sides are the cylinder $x^2 + y^2 = 4$ and its top is the paraboloid $z = 6 - x^2 - y^2$. Its density is $\rho = 3 \text{ gm/cm}^3$. Find its total mass and the $z$-component of its center of mass.
6. Find the mass and the $z$-component of the center of mass of the hemisphere $\sqrt{25 - x^2 - y^2}$ whose density is given by $\delta = \frac{1}{5}(x^2 + y^2 + z^2)$. 
7. A cardboard box is constructed with a hinge at the back so that the top, bottom and back have one sheet of cardboard while the sides and front have two sheets of cardboard. If the volume is $3 \text{ ft}^3$, find the dimensions of the box which minimize the amount of cardboard needed.
8. Compute $\int \int x \, dx \, dy$ over the region inside the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$ between the lines $y = \frac{x}{2}$ and $y = -\frac{x}{2}$ in the 1st and 4th quadrants.

HINT: Use the elliptic coordinate system:

$$x = 4t \cos \theta \quad y = 2t \sin \theta$$