Write your complete solutions on the answer sheets. Do not write on this test paper.

(1) (20 points) Sketch the region \( R \) in the \( xy \)-plane bounded by the two curves \( y = x^2 \) and \( x = y^2 \). Using double iterated integrals, do the following.
   (a) Find the area of \( R \).
   (b) Find the centroid of \( R \).

(2) (20 points) Sketch the two curves \( y = x \) and \((x - 1)^2 + y^2 = 1\) and identify the points of intersection. Let \( R \) denote the smaller of the two regions bounded by the curves.
   (a) Express the area of \( R \) as an iterated integral in \((x, y)\)-coordinates. Do not evaluate.
   (b) Express the area of \( R \) as an iterated integral in \((r, \theta)\)-coordinates. Do not evaluate.

(3) (10 points) Let \( S \) denote the solid region in the first octant of \( xyz \)-space that lies between the two planes \( 2x + 2y + z = 2 \) and \( x + y + z = 1 \). Set up, but do not evaluate, a triple iterated integral for the volume of \( S \).

(4) (20 points) Let \( S \) denote the solid region in \( xyz \)-space that lies between the plane \( z = 0 \) and the paraboloid \( z = 9 - x^2 - y^2 \). Set up, but do not evaluate, the following.
   (a) A triple iterated integral for the volume of \( S \) in rectangular coordinates.
   (b) A triple iterated integral for the volume of \( S \) in cylindrical coordinates.

(5) (30 points) Starting with the solid ball in \( xyz \)-space defined by \( x^2 + y^2 + z^2 \leq 4 \), let \( D \) denote the dome-shaped portion of the ball that lies above the plane \( z = 1 \). Set up, but do not evaluate, the following.
   (a) A triple iterated integral for the volume of \( D \) in rectangular coordinates.
   (b) A triple iterated integral for the volume of \( D \) in cylindrical coordinates.
   (c) A triple iterated integral for the for the volume of \( D \) in spherical coordinates.