• Be sure to show all your work!
• Be sure to give reasons for your answers!
• Points will probably be taken off if you do not give a clear indication of 
  the method and write your solution neatly, in order, and clearly indicate 
  your final answer.
• Points may be taken off for a correct answer with a mistake in the sup-
  porting work.
• No books, notes or calculators of any kind are permitted on the test.
• Write each solution in the space provided, not on scratch paper.
• If you need more room, write on the back of the page.
• Time limit: 1.5 hours (90 minutes). Points may be deducted for exceeding 
  this limit.
1. Evaluate the iterated integrals:

(a) \[ \int_{0}^{1} \int_{x}^{2x} (5x + 2y) \, dy \, dx \]

(b) \[ \int_{0}^{1} \int_{0}^{y} \int_{0}^{z} y \, dx \, dz \, dy \]
2. (a) Write (but do not evaluate!) the iterated integral which results from changing the order of integration:

\[ \int_{0}^{2} \int_{0}^{x^2} \sin(xy^2) \, dy \, dx \]

(b) Let \( R \) be the triangular region with vertices (0, 0), (1,1), and (0, 3). If we want to integrate a function \( f(x, y) \) over \( R \) by integrating with respect to \( x \) first, it requires a sum of two iterated integrals. Your job is to write the sum of these two iterated integrals. (Of course, each integral will be in terms of \( f(x, y) \).)
3. Use polar coordinates to evaluate \( \iint_R x \, dA \), where \( R \) is the region in the first quadrant bounded by the circle \( x^2 + y^2 = 9 \).
4. Suppose a lamina occupies the region $D$ in the $xy$-plane bounded by the parabola $y = x^2$ and the line $y = x$, and has density function $\rho(x, y) = e^y$. Set up (but do not evaluate!) iterated integrals giving the mass and the center of mass. Make sure to clearly indicate the formulas for the coordinates of the center of mass.
5. Set up (but do not evaluate!) a triple integral in rectangular coordinates giving the volume of the solid region bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 2x$. 
6. Convert the following integral from cylindrical coordinates to spherical coordinates (but do not evaluate the integral!):

\[
\int_0^{2\pi} \int_0^1 \int_0^{\sqrt{1-r^2}} r^2 \cos \theta \, dz \, dr \, d\theta
\]