Answer each of the following questions. Show all work, as partial credit may be given. This exam will be counted out of a total of 80 points.

1. (10 pts.) Evaluate the iterated integral \[ \int_0^1 \int_y^{2y} \int_0^{2y-z} z \, dx \, dz \, dy \]

2. (12 pts.) Evaluate the integral \[ \iint_D x \, dA \] where \( D \) is the region in the first quadrant bounded by the circle \( x^2 + y^2 = 4 \) after changing the integral into polar coordinates.

3. (12 pts.) Find the centroid of the region in the \( x-y \) plane bounded by the \( x \)-axis and the curve \( y = 4 - x^2 \). (Hint: You may use symmetry, and the fact that the area of the region is \( \frac{32}{3} \) to simplify your work.)

4. (14 pts. each) Write \[ \iiint_E xyz \, dV \] as an iterated triple integral in the given order where \( E \) is the region in the first octant bounded by the coordinate planes and the plane \( 2x + y + z = 4 \). Do not evaluate.
   
   (a) \( dz \, dy \, dx \)

   (b) \( dx \, dy \, dz \)

5. (18 pts.) Consider the double integral \[ \iint_R \frac{y-x}{y+x} \, dA \] where \( R \) is the triangular region in the \( x-y \) plane bounded by the lines \( y = x \), \( y = -x \), and \( x = 1 \). Make the change of variables \( x = u + v, \ y = u - v \) in the above integral. Do not evaluate. Your answer should be in the form of an iterated double integral in the variables \( u \) and \( v \).