Math 283: Quiz 8 (Take-home; due in class on Tues. Nov. 18)

Name: ____________________________

Please use your Maple, textbook, or notes if you like. Please carry out the integrals in the homework, but it is not necessary to do so here. Note that there are 4 problems; 2 more on the back.

1. Section 12.7 Problem 9: We set up the integral \( \iiint_E 6xydV \), where \( E \) lies under the plane \( z = 1 + x + y \) and above the region in the \( xy \)-plane bounded by the curves \( y = \sqrt{x} \), \( y = 0 \) and \( x = 1 \).

   (a) Since \( E \) has “above” and “below” bounds, it’s natural to do our integration in \( z \) first. What are the limits? \( \leq z \leq \).

   (b) What is the region in the \( xy \)-plane that bounds \( E \) like? Draw a picture below. Will you integrate in \( y \) or \( x \) first? The limits for the inner integral may depend on the outer variable. The integral is given by

\[
\int \int \int 6xy \, dz \, d \, d .
\]

2. Section 12.7 Problem 13: Set up the integral \( \iiint_E xdV \), where \( E \) is bounded by the paraboloid \( x = 4y^2 + 4z^2 \) and the plane \( x = 4 \).
3. Section 12.8 Problem 9: Use cylindrical coordinates to set up \( \iiint_E y\,dV \), where \( E \) is the solid that lies between the cylinders \( x^2 + y^2 = 1 \) and \( x^2 + y^2 = 4 \), above the \( xy \)-plane and below the plane \( z = x + 2 \). Note \( dV = r\,dz\,dr\,d\theta \) in some order.

4. Section 12.8 Problem 16: Use spherical coordinates to set up \( \iiint_H (x^2 + y^2)\,dV \), where \( H \) is the hemispherical region that lies above the \( xy \)-plane and below the sphere \( x^2 + y^2 + z^2 = 1 \). Note \( dV = \rho^2\sin\phi\,d\rho\,d\theta\,d\phi \) in some order.