Triple Integrals

GROUP MEMBERS:

1. ______________________________

2. ______________________________

3. ______________________________

4. ______________________________

Problem 1: Set up the limits of integration for a triple integral $\int\int\int_E$ f(x,y,z) dV where

E ={(x,y,z)| $0 \leqslant x \leqslant 2$, $1 \leqslant y \leqslant 2-x$, $0 \leqslant z \leqslant 4- x^2-y^2$}.

Fill in the limits of integration for the integral and put the dx, dy, dz in the correct order:

$$\int \quad \int \quad \int \qquad f(x,y,z)$$

Person 1: Put the limits for the outer integral.

Person 2: Put the limits for the middle integral.

Person 3: Put the limits for the inner integral.

Problem 2: Set up the limits of integration for a triple integral

$\int\int\int_E x^2+y^2 + z^2 \; dV$ where E is the region inside the sphere $x^2+y^2 + z^2 = 9$ and above the xy plane.

Person 4: Make a sketch of the region E in xyz space.

Person 1: Make a sketch on the xy plane showing the projection of the region E onto the xy plane. Label the curves in your picture.

Person 2: Determine the limits for the x variable using the above sketch.

Person 3: Draw a typical x point in the above sketch, "chain saw" (i.e. draw a vertical line for) the y values corresponding to this x point and then write out the range of y values.

Person 4: In the sketch of the region E on the other side, put in a typical point (x,y, 0) and then "chain saw" the z values above it (i.e. Draw a vertical line in the z direction showing the z values). Write out the range of the z values.

Person 1: Using the above limits, set up the endpoints for the triple integral $\int\int\int_E x^2+y^2 + z^2 \quad dV$
(Do not evaluate)

Problem3: Convert the integral $\int\int\int_E x^2+y^2 + z^2 \; dV$ into spherical coordinates.

Person 2: Give the limits of the r variable.

Person 3: Give the limits of the f variable.

Person 4: Give the limits of the q variable.

Person 1: Convert dV = dx dy dz into spherical coordinates.

Person 2: Convert the function $f(x,y,z) = x^2+y^2 + z^2$ into spherical coordinates.

Person 3: Set up the endpoints for the integral in spherical coordinates.

Person 4: Write out the integral completely converted into spherical coordinates.

Everybody: evaluate the integral.