

Extra credit problem, due 7/2 in class. Maximum credit is equivalent to one homework assignment.

Find the volume of the intersection of a square cylinder of side length  $2a$  with a ball of radius  $R_1$  centered at the origin. Explicitly, the ball is the set of points satisfying  $x^2 + y^2 + z^2 \leq 1$  and the cylinder is the intersection of the four half-spaces  $x \leq a$ ,  $x \geq -a$ ,  $y \leq a$ ,  $y \geq -a$ . For full credit, expand any formal answer in a power series in  $a$  (try to get at least the first two non-zero terms). Computer assistance is permitted but that data must be included as well (input and output).