

Your Name:

Duration of the Quiz is 20 minutes. There is only one problem, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited. Calculators are NOT permitted.

1. Let  $S$  be the solid region which is bounded by the cylinders  $x^2 + y^2 = 1$  and  $x^2 + y^2 = 4$  and the cones  $z = \sqrt{3(x^2 + y^2)}$  and  $z\sqrt{3} = \sqrt{x^2 + y^2}$ .

(a) Sketch the solid region  $S$ .

(b) Set up an iterated integral in Cylindrical coordinates to compute the volume of the solid region  $S$ .

(c) Set up an iterated integral in spherical coordinates to compute the volume of the solid region  $S$ .