

## HOMEWORK 4

NAME: \_\_\_\_\_

Problem 1: Evaluate the integral

$$\int_{-1}^1 \int_0^{2\pi} \int_0^{1+\cos(\theta)} 4r dr d\theta dz.$$

Problem 2: Convert the integral

$$\int_{-1}^1 \int_0^{\sqrt{1-y^2}} \int_0^x (x^2 + y^2) dz dx dy$$

to an equivalent integral in cylindrical coordinates and evaluate the result.

Problem 3: Evaluate the spherical integral

$$\int_{\pi/6}^{\pi/3} \int_{\csc(\phi)}^{2\csc(\phi)} \int_0^{2\pi} \rho^2 \sin(\phi) d\theta d\rho d\phi.$$

Problem 4: Find the volume of the solid bounded below by the hemisphere  $r = 1, z \geq 0$ , and above by the cardioid of revolution  $r = 1 + \cos(\phi)$ .

Problem 5: Find the volume of the region that lies inside the sphere  $x^2 + y^2 + z^2 = 2$  and outside the cylinder  $x^2 + y^2 = 1$ .