

# Homework 3

Due date: April 14, 2017

**Problem 1:** Find the volume of the solid that lies under the paraboloid  $z = x^2 + y^2$ , above the  $xy$ -plane, and inside the cylinder  $x^2 + y^2 = 2x$ .

**Problem 2:** Evaluate the following integrals by changing to spherical coordinates

1. 
$$\int_0^1 \int_0^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{2-x^2-y^2}} xy \, dz \, dy \, dx;$$
2. 
$$\int_{-a}^a \int_{-\sqrt{a^2-x^2}}^{\sqrt{a^2-x^2}} \int_{-\sqrt{a^2-x^2-y^2}}^{\sqrt{a^2-x^2-y^2}} (x^2z + y^2z + z^3) \, dz \, dy \, dx;$$

**Problem 3:** Draw pictures of the surfaces described by  $z = \sqrt{x^2 + y^2}$  and  $x^2 + y^2 + z^2 = z$ . Find the volume of the solid bounded the two equations.