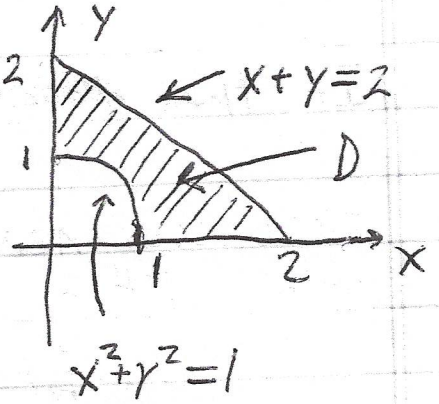
Take Home Problem set / Exam MTH 310
Due April 22.

1. Express the integral $\int_0^1 \int_0^{x^3} 36x^2y \, dy \, dx$ as an equivalent integral with the order of integration reversed, that is, $dx\,dy$. Evaluate the integral in whichever form you prefer.

2. Compute $\iint_D (x+y) \, dA$ if D is the region shown. (Hint: You will want to divide D into two regions of type I or two regions of type II.)



3. Find the volume of the region bounded by the cone $z = 2\sqrt{x^2+y^2}$ and the paraboloid $z = 3-x^2-y^2$. (Hint: use polar (or cylindrical) coordinates)

(Continued)

4. Given the integral

$$\int_0^4 \int_{-\sqrt{16-x^2}}^{\sqrt{16-x^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{32-x^2-y^2}} z \, dz\, dy\, dx$$

a) Rewrite it in cylindrical coordinates
b) Rewrite it in spherical coordinates
c) Evaluate it using whichever coordinates you prefer.