16.3 # 6

6. The region is the half cylinder in Figure 16.42.

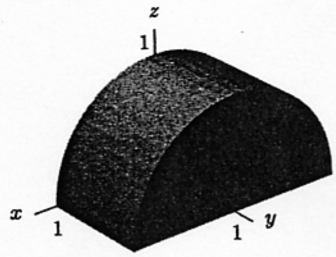

Figure 16.42

16.3 # 16

16. (a) The equation of the surface of the whole cylinder along the y-axis is $x^2 + z^2 = 1$. The part we want is

$$z = \sqrt{1 - x^2} \qquad 0 \le y \le 10.$$

See Figure 16.52.

Figure 16.52

(b) The integral is

$$\int_D f(x, y, z)\, dV = \int_0^{10} \int_{-1}^{1} \int_0^{\sqrt{1-x^2}} f(x, y, z)\, dz dx dy.$$

16.4 # 14

14. The presence of the term $x^2 + y^2$ suggests that we should convert the integral into polar coordinates. Since $\sqrt{x^2 + y^2} = r$, the integral becomes

$$\int_R \sqrt{x^2 + y^2}\, dx dy = \int_0^{2\pi} \int_2^3 r^2\, dr d\theta = \int_0^{2\pi} \left. \frac{r^3}{3} \right|_2^3 d\theta = \int_0^{2\pi} \frac{19}{3}\, d\theta = \frac{38\pi}{3}.$$

16.4 # 16

16. By the given limits $0 \leq x \leq -1$, and $-\sqrt{1-x^2} \leq y \leq \sqrt{1-x^2}$, the region of integration is in Figure 16.66.

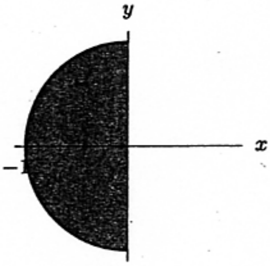

Figure 16.66

In polar coordinates, we have

$$\int_{\pi/2}^{3\pi/2} \int_0^1 r \cos\theta \, r \, dr \, d\theta = \int_{\pi/2}^{3\pi/2} \cos\theta \left(\frac{1}{3} r^3\right)\Big|_0^1 \, d\theta$$

$$= \frac{1}{3} \int_{\pi/2}^{3\pi/2} \cos\theta \quad d\theta$$

$$= \frac{1}{3} \sin\theta \Big|_{\pi/2}^{3\pi/2} = \frac{1}{3}(-1-1) = -\frac{2}{3}$$

16.5 # 6

6. Using cylindrical coordinates, we get:

$$\int_0^1 \int_0^{2\pi} \int_0^4 f \cdot r dr \, d\theta \, dz$$

16.5 # 8

8. Using spherical coordinates, we get:

$$\int_0^{\pi} \int_0^{\pi} \int_2^3 f \cdot \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$$

16.5 # 12

12.

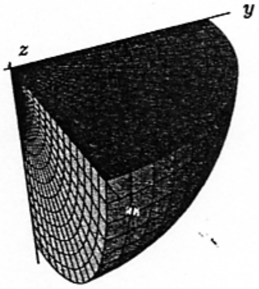

Figure 16.75

R is one eighth of a sphere of radius 1, below the xy-plane and under the first quadrant.