Use double integration in polar coordinates to find the volume of the solid that lies below the given surface and above the plane region R bounded by the given curve.

1. $z = x^2 + y^2; r = 3$

Evaluate the given integral by first converting to polar coordinates.

2. $\int_0^1 \int_x^1 x^2\, dy\, dx$

Solve by double integration in polar coordinates.

3. Find the volume of the solid bounded by the paraboloids z = 12 - 2x^2-y^2 and z = x^2 + 2y^2

Find the centroid of the plane region bounded by the given curves. Assume that the density is δ≡1 for each region.

4. x = -2, x = 2, y = 0, y = x^2+1

Find the mass and centroid of the plane lamina with the indicated shape and density.

5. The region bounded by x = e, y = 0, and y = ln x for 1 ≦ x ≦ e, with δ(x,y)≡1