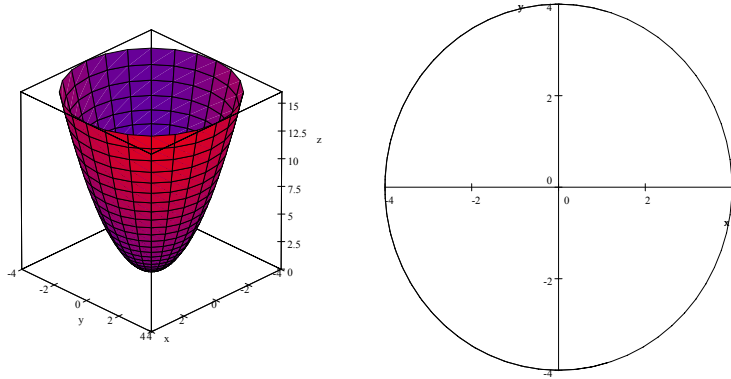


Problem 2(8 pt) Express the surface area of the part of the paraboloid $z = x^2 + y^2$ that lies under the plane $z = 16$ as an **iterated double integral in polar coordinates**. *Do not evaluate.*



$$f(x,y) = x^2 + y^2. \text{ So, } f_x = 2x, f_y = 2y.$$

Note that $dA = r dr d\theta$ in polar coordinates.
Using the surface area formula, we get

$$\begin{aligned} S &= \iint_D \sqrt{1 + 4x^2 + 4y^2} dA \\ &= \int_0^{2\pi} \int_0^4 \sqrt{1 + 4r^2} r dr d\theta. \end{aligned}$$