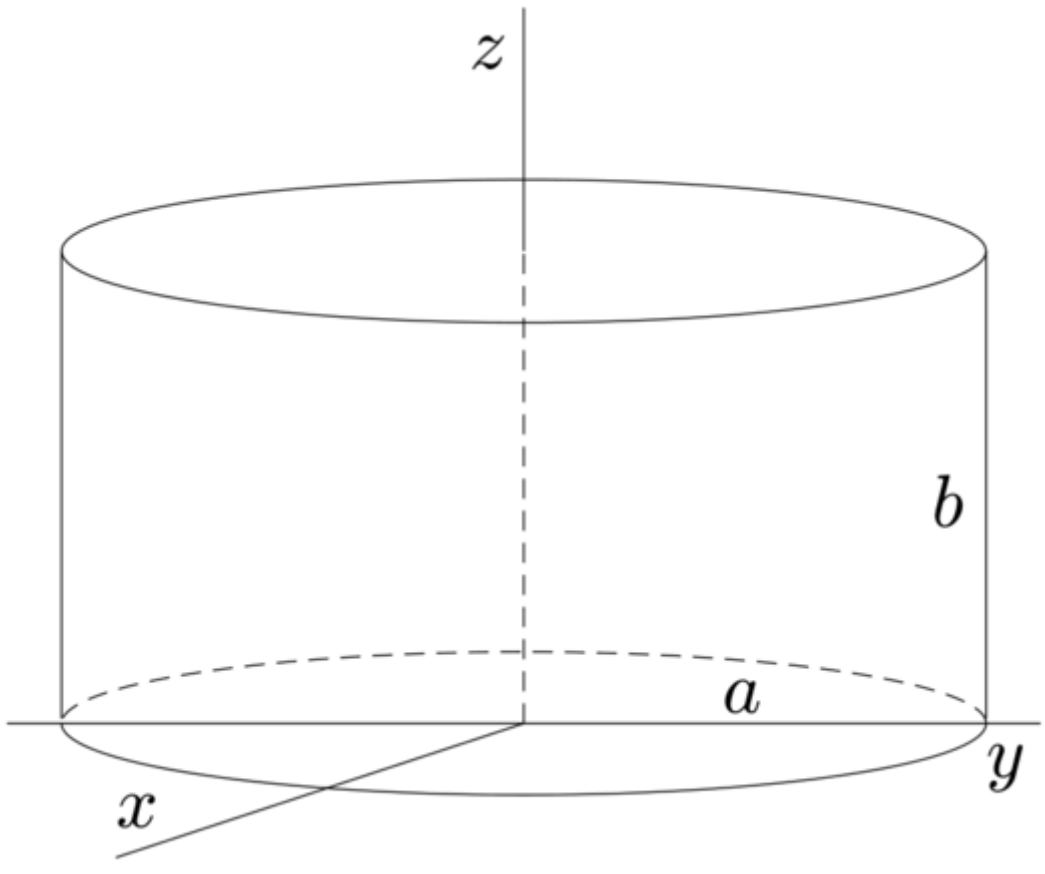
Surface Area of a Cylinder

Compute the lateral surface area $A = \int_S dS$ of a cylinder (see figure) in two ways.



(a) Unroll the cylinder and compute the area of the resulting rectangle.

(b) Define the cylinder parametrically as

$$\boldsymbol{r} = a\cos\theta\,\boldsymbol{i} + a\sin\theta\,\boldsymbol{j} + z\,\boldsymbol{k}, \qquad \text{for } 0 \le z \le b \quad \text{and} \quad 0 \le \theta \le 2\pi,$$

and compute the surface integral.