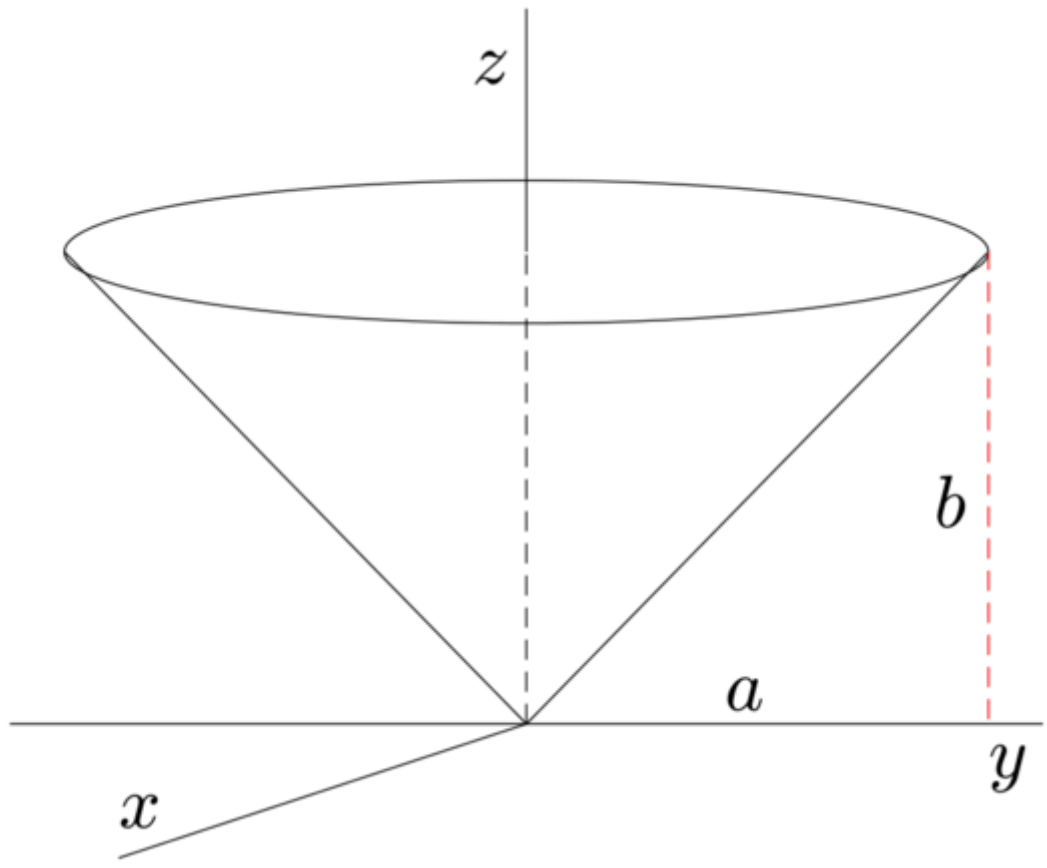
Surface Area of a Cone

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



(a) Unroll the cone and compute the area of the resulting circular sector.

(b) Define the cone parametrically as

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

and compute the surface integral.