

Exercise 90

The volume of a right circular cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height.

- (a) Find the rate of change of the volume with respect to the height if the radius is constant.
 - (b) Find the rate of change of the volume with respect to the radius if the height is constant.
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Solution**Part (a)**

If the radius is constant, the rate of change of the volume with respect to the height is

$$\frac{dV}{dh} = \frac{d}{dh} \left(\frac{1}{3}\pi r^2 h \right) = \frac{1}{3}\pi r^2.$$

Part (b)

If the height is constant, the rate of change of the volume with respect to the radius is

$$\frac{dV}{dr} = \frac{d}{dr} \left(\frac{1}{3}\pi r^2 h \right) = \frac{2}{3}\pi r h.$$