

Exercise 67

For the following exercises, use the written statements to construct a polynomial function that represents the required information.

A cube has an edge of 3 feet. The edge is increasing at the rate of 2 feet per minute. Express the volume of the cube as a function of m , the number of minutes elapsed.

Solution

The volume of a cube is

$$V = L^3.$$

The edge length can be expressed as a linear function since the rate of increase is constant: $L = 2t + 3$. After m minutes, then, $L = 2m + 3$. Therefore, the volume of the cube after m minutes is

$$\begin{aligned} V(m) &= (2m + 3)^3 \\ &= (2m)^3 + 3(2m)^2(3) + 3(2m)(3)^2 + (3)^3 \\ &= 8m^3 + 36m^2 + 54m + 27. \end{aligned}$$