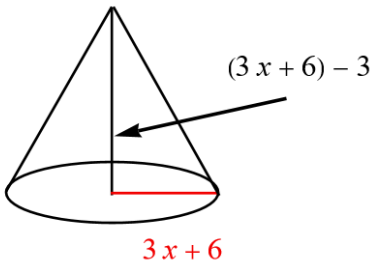
Exercise 79

For the following exercises, write the polynomial function that models the given situation.

A right circular cone has a radius of $3x + 6$ and a height 3 units less. Express the volume of the cone as a polynomial function. The volume of a cone is $V = \frac{1}{3}\pi r^2 h$ for radius r and height h.

Solution

Draw a schematic of the cone.



Its volume is

$$\begin{aligned} V &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3}\pi(3x+6)^2[(3x+6)-3] \\ &= \frac{1}{3}\pi(9x^2+36x+36)(3x+3) \\ &= \pi(9x^2+36x+36)(x+1) \\ &= 9\pi(x^2+4x+4)(x+1) \\ &= 9\pi[(x^2+4x+4)x+(x^2+4x+4)(1)] \\ &= 9\pi(x^3+4x^2+4x+x^2+4x+4) \\ &= 9\pi(x^3+5x^2+8x+4) \\ &= 9\pi x^3+45\pi x^2+72\pi x+36\pi. \end{aligned}$$