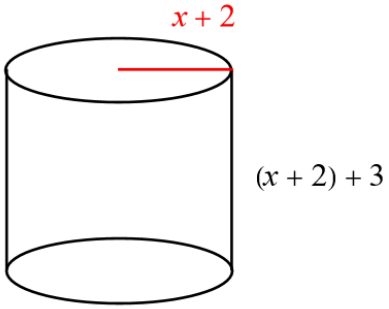
Exercise 78

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

A cylinder has a radius of $x + 2$ units and a height of 3 units greater. Express the volume of the cylinder as a polynomial function.

Solution

Draw a schematic of the cylinder.



Its volume is

$$\begin{aligned} V &= \pi r^2 h \\ &= \pi(x+2)^2[(x+2)+3] \\ &= \pi(x^2+4x+4)(x+5) \\ &= \pi[(x^2+4x+4)x+(x^2+4x+4)5] \\ &= \pi(x^3+4x^2+4x+5x^2+20x+20) \\ &= \pi(x^3+9x^2+24x+20) \\ &= \pi x^3+9\pi x^2+24\pi x+20\pi. \end{aligned}$$