(801, #33) The radius of a right circular cylinder is decreasing at a rate of 1.2 cm/s while its height is increasing at a rate of 3 cm/s. At what rate is the volume of the cylinder changing when the radius is 80 cm and the height is 150 cm?

Solution: Since the volume of the cylinder is \( V = \pi r^2h \) we have

\[
\frac{dV}{dt} = \pi \left( 2rh \frac{dr}{dt} + r^2 \frac{dh}{dt} \right) = \pi \left( r \left(2h \left(-1.2\right) + r \left(3\right) \right) \right)
\]

When \( r = 80 \) and \( h = 150 \) we have

\[
\frac{dV}{dt} = \pi \left( 80 \left(-2.4\right) + 80 \left(3\right) \right) = -96 \cdot 10^2 \pi
\]