**(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 $V = \pi\, r^2 h$ we have

$$\frac{dV}{dt} = \pi\,(2rh\frac{dr}{dt} + r^2\frac{dh}{dt}) = \pi\ r(2h(-1.2) + r(3))$$

When r = 80 and h = 150 we have

$$\frac{dV}{dt} = \pi\ 80^*(-2.4^*\,150 + 3^*\,80) = -96^*\,10^2\pi$$