A cross-section is a disk with radius $\frac{1}{3}e^y$ [since $y = \ln(3x)$], so its area is $A(y) = \pi(\frac{1}{3}e^y)^2$.

$V = \int_4^6 \pi(\frac{1}{3}e^y)^2 dy = \frac{1}{9}\pi \int_4^6 e^{2y} dy = \frac{1}{9}\pi \left[\frac{1}{2}e^{2y}\right]_4^6 = \dfrac{\pi(e^{12} - e^8)}{18}$