Find the volume of the solid generated by revolving the region bounded by $y = e^x$, $y = 0$, $x = 0$, and $x = \ln 3$ about the $x$-axis.

**Answer:** Draw the picture. Our plan is to approximate the region by using discs. Chop the $x$-axis from $x = 0$ to $x = \ln 3$ into small pieces. Over each piece draw a rectangle. Spin each rectangle. Get a disc (see the picture) of volume $\pi r^2 t$, where $t$ is the thickness (for us this is $dx$ which is a little piece of the $x$-axis) and $r$ is the radius (for us this is the $y$-coordinate at the top of our rectangle minus the $y$-coordinate at the bottom of our rectangle, all written in terms of $x$; in other words: $e^x$). So each disc has volume $\pi (e^x)^2 dx = \pi e^{2x} dx$. We add up the volume inside all of the discs and take the limit. This amounts to finding the definite integral:

$$\pi \int_0^{\ln 3} e^{2x} dx = \pi \frac{e^{2x}}{2} \bigg|_0^{\ln 3} = \pi \left( e^{2\ln 3} - 1 \right) = \frac{\pi}{2} (9 - 1) = 4\pi.$$