Problem statement Suppose $R$ is the region enclosed by the curves $y = \ln x$, $y = 0$, $x = 1$ and $x = e$. Find the area $A$ of $R$, find the volume $V_1$ of the solid object formed when $R$ is revolved about the $x$-axis, and find the volume $V_2$ of the solid object formed when $R$ is revolved about the $y$-axis.