

1. Let  $R$  be the region enclosed by the  $x$ -axis, the vertical lines  $x = 1$  and  $x = e$ , and the curve  $y = \ln x$ .
  - (a) Find the area of  $R$ .
  - (b) Find the volume of the solid obtained by revolving  $R$  about the  $x$ -axis.
  - (c) Find the volume of the solid obtained by revolving  $R$  about the  $y$ -axis.
  
2. Let  $R_1$  be the region in the first quadrant enclosed by the line  $x + y = 1$  and the circle  $x^2 + y^2 = 1$ .  
Let  $R_2$  be the region in the first quadrant enclosed by the line  $x + y = 1$  and the curve  $\sqrt{x} + \sqrt{y} = 1$ .  
Which one has the larger area?
  
3. Let  $R$  be the region enclosed by the curves  $y^2 = x - 2$ ,  $x = 1$ ,  $y = 1$ , and  $y = -2$ . Find the volume of the solid obtained by revolving  $R$  about the axis  $x = -1$ .