For questions: at52@rice.edu April 22

EXERCISE SHEET: VOLUMES OF REVOLUTION - SHELLS

1. Let R be the region bounded by the curve $y = \frac{1}{1+x^2}$ and the lines $x = 0$, $x = 3$ and $y = 0$. Using the method of shells, compute the volume of the solid obtained by rotating R around the y-axis.

2. Let R be the region bounded by the curve $x = ye^y$ and the lines $x = 0$, $x = 2$ and $y = 2$. Write an integral that computes the volume of the solid obtained by rotating R around the x-axis, using the method of shells.

3. Let R be the region bounded by the curve $y = \ln(x)$ and the lines $x = 1$, $x = e$ and $y = 0$. Using the method of shells, compute the volume of the solid obtained by rotating R around the x-axis. (*Hint: You can assume that the antiderivative of* ye^y *is* $ye^y - e^y$)

4. Let R be the region bounded by the curve $y = \sqrt{x}$ and the lines $x = 0$ and $x = 1$. Compute the volume of the region obtained by rotating R around the line $x = 2$.

5. Let R be the region bounded by the curves $x = y^2$ and $x = y^2 - 2y + 1$ and the line $x = 2$. Compute the volume of the region obtained by rotating R around the line y-axis.

6. Use the method of shells to find the volume of the donut created when the circle $x^2 + y^2 = 4$ is rotated around the line $x = 4$.