Worksheet 13, Tuesday, April 24th, 2018

Volumes of Revolution

1. Consider the region in the first quadrant bounded by $y = e^x + 1$, $y = 4$, and the y–axis.

   (a) Draw the bounded region.

   (b) Compute the bounded area.

   (c) Compute the volume of the 3–dimensional solid obtained by rotating this region about the horizontal line $y = -2$. Sketch the 3–dimensional solid, along with one of the approximating washers.

2. Consider the region bounded by $y = x^2$, $y = 1$, and $x = 0$, with $x \geq 0$.

   (a) Rotate the region about the x–axis. Compute the volume of the resulting solid. Sketch the 3–dimensional solid, along with one of the approximating washers.

   (b) Rotate the same bounded region about the y–axis. Compute the volume of the resulting solid. Sketch the 3–dimensional solid, along with one of the approximating disks.

3. Answer each of the following questions.

   (a) First find the equation of the tangent line to the curve $y = \ln x$ at the point where $x = e$.

   (b) Next consider the region bounded between $y = e^x$ and the tangent line found in part (a) above, and also bounded between $x = 0$ and $x = e$. Rotate this region about the x–axis. Compute the resulting volume. Sketch the 3–dimensional solid, along with one of the approximating washers.

4. Consider the region bounded between $y = \dfrac{2}{x}$ and $y = 3 - x$. Rotate this region about the x–axis. Compute the resulting volume. Sketch the 3–dimensional solid, along with one of the approximating washers.

$$\boxed{\textbf{Turn in your own solutions.}}$$