Questions for recitation 19 February 2021

1. Consider the region in the first quadrant bounded by the curves $y = \sqrt{x}$ and $y = \frac{x^2}{8}$. What is the volume of the solid generated by revolving this region about the line $y = -2$?

2. What is the volume of a doughnut whose height is 1 inch and whose hole is 1 inch across?

3. Consider the region bounded by the y-axis, the line $y = x$, and the upper half of the circle given by the equation $(x-1)^2 + (y-2)^2 = 1$. Describe the shape of the solid generated by rotating this region about the y-axis, and find its volume.

4. Exercises 6.3: #23, 24, 26, 29, 31, 44, and 48

   Exercises 7.1: #73

5. A couple of weeks ago we derived the "normalization constant" for Gamma probability density functions through the following indefinite integral:

$$\int_0^\infty t^n e^{-\lambda t}\, dt = \frac{n!}{\lambda^{n+1}},$$

   for a positive integer n (the "shape parameter") and constant $\lambda > 0$ (the "rate parameter").

   We used this result, along with the washer method, to see that the volume of the solid generated by revolving the region in the first quadrant below the curve $y = x^n e^{-\lambda x}$ about the x-axis is

$$V = \frac{\pi(2n)!}{(2\lambda)^{2n+2}}.$$

   But what is the volume of the solid generated by revolving this region about the y-axis? Can you find it using the washer method?