1. Problems to be presented on 9-13

(1) First problem for presentation
   (a) Show that $\int_0^{\pi/2} \sin^n x dx = \frac{n-1}{n} \int_0^{\pi/2} \sin^{n-2} x dx$
   (b) Use this to justify the following formulas

$$\int_0^{\pi/2} \sin^{2n+1} x dx = \frac{2 \cdot 4 \cdot 6 \cdot \ldots \cdot 2n}{3 \cdot 5 \cdot 7 \cdot \cdots \cdot (2n+1)}$$

$$\int_0^{\pi/2} \sin^{2n} x dx = \frac{1 \cdot 3 \cdot 5 \cdot \cdots \cdot (2n-1)}{2 \cdot 4 \cdot 6 \cdot \ldots \cdot 2n} \cdot \frac{\pi}{2}$$

(2) Second Problem for Presentation: A torus is made by rotating the circle $x^2 + (y - 2R)^2 = R^2$ around the x axis. What is its volume?

(3) Third problem for presentation: We draw two disks, both of radius 1, whose centers are distance 1 apart. What is area of their union?