**Problem statement** Start with the region $A$ in the first quadrant enclosed by the $x$-axis and the parabola $y = 2x(2 - x)$. Then obtain solids of revolution $S_1$, $S_2$, and $S_3$ by revolving $A$ about the lines $y = 4$, $y = -2$, and $x = 4$ respectively. All three solids are (unusual) “doughnuts” which are 8 units across, whose hole is 4 units across, and whose height is 2 units. Sketch them.

a) Which do you expect to have larger volume, $S_1$ or $S_2$? Compute their volumes exactly and check your guess.

b) Compute the volume of $S_3$. (It may be harder to guess in advance how $S_3$ compares in volume to $S_2$ and $S_1$.)