

**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  $S_1$ .)