

Math 199, Fall 2023  
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### Participation assignment 17 - Areas between curves

**Estimated time:** 25-45 minutes.

**Point value:** 3 points.

**Goals:** Practice adapting integration to compute areas of slightly more complicated regions.

1) You have a soup bowl whose cross-section is shaped like the curve  $y = \frac{1}{3}x^2$ . If the bowl is 6 units wide and is symmetric about its center, what is the (cross-sectional) area of the maximum amount of soup that can fit in the bowl?

2) Find the area of the region enclosed by the curves  $y = \frac{8}{x}$ ,  $y = 2x$ , and  $x = 4$ .

3) A crescent ( moon) shape is (approximately?) formed as the region between two circles with different centers and radii (think about why the moon takes that shape). Set up an integral for the area of the *smaller* of the two crescents formed by the circles  $x^2 + y^2 = 1$  and  $x^2 + (y+1)^2 = 2$ . Sketch the circles first so you correctly identify which region is the crescent. Do you know how to compute this integral?

4) Find the area of the region enclosed by the curves  $y = \frac{x}{2x^2 - 12x - 4}$ ,  $y = \frac{3}{2x^2 - 12x - 4}$  and the  $y$ -axis.