Worksheet: Arclength and surface area

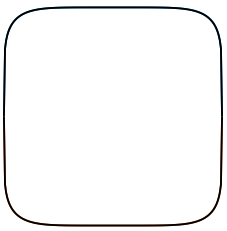
1. Sketch the curve and find the arclength:

$$x = \frac{1}{3}\sqrt{y}(y-3), \qquad 1 \le y \le 9$$

2. For $L > 0$, a common shape for tables is the curve

$$x^6 + y^6 = L^6$$

as shown at right. Add axes to the figure, and scales on the axes. Completely set up, but do not evaluate, an integral for the length of the edge of the table. Give useful bounds for the length.



3. Find the surface area of the surface formed by rotating this curve around the y-axis:

$$y = \frac{1}{3}x^{3/2}, \qquad 0 \le x \le 4$$

4. Sketch the surface formed by rotating the curve

$$y = \frac{1}{x}, \qquad 1 \le x \le \infty$$

around the x-axis. Show that the surface area is infinite. (We found the volume of this shape, sometimes called *Gabriel's horn*, in class. It was finite, specifically $V = \pi$. Thus this horn can be filled with paint but not painted.)