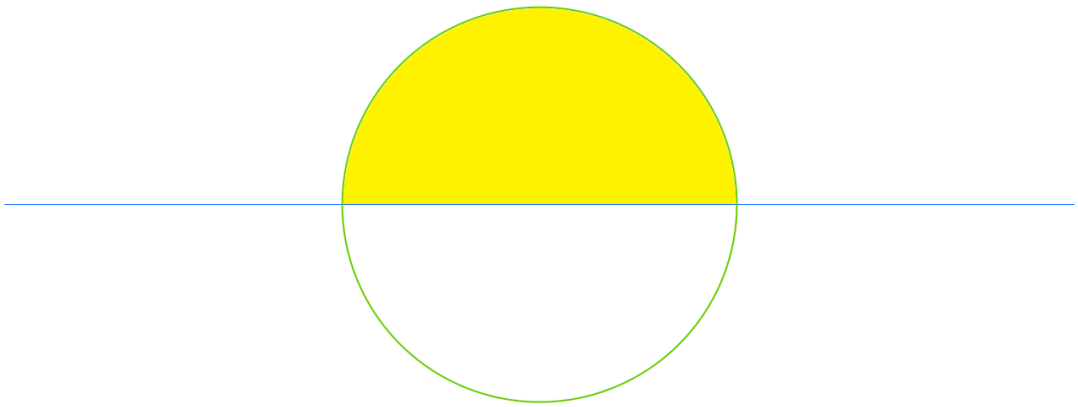
Sphere Formulas

A sphere of radius r is created by revolving the region where $0 \leq y \leq \sqrt{r^2 - x^2}$ about the x axis between $x = -r$ and $x = r$.



$$V = \pi \int_{-r}^{r} y^2 dx = \pi \int_{-r}^{r} (r^2 - x^2) dx = 2\pi \int_{0}^{r} (r^2 - x^2) dx$$

$$= 2\pi \left[r^2 x - \frac{1}{3} x^3 \right]_0^r = 2\pi \left(r^3 - \frac{1}{3} r^3 \right) = 2\pi \cdot \frac{2}{3} r^3 = \frac{4}{3} \pi r^3$$

$$A = \frac{dV}{dr} = \frac{4}{3} \pi \cdot 3r^2 = 4\pi r^2$$