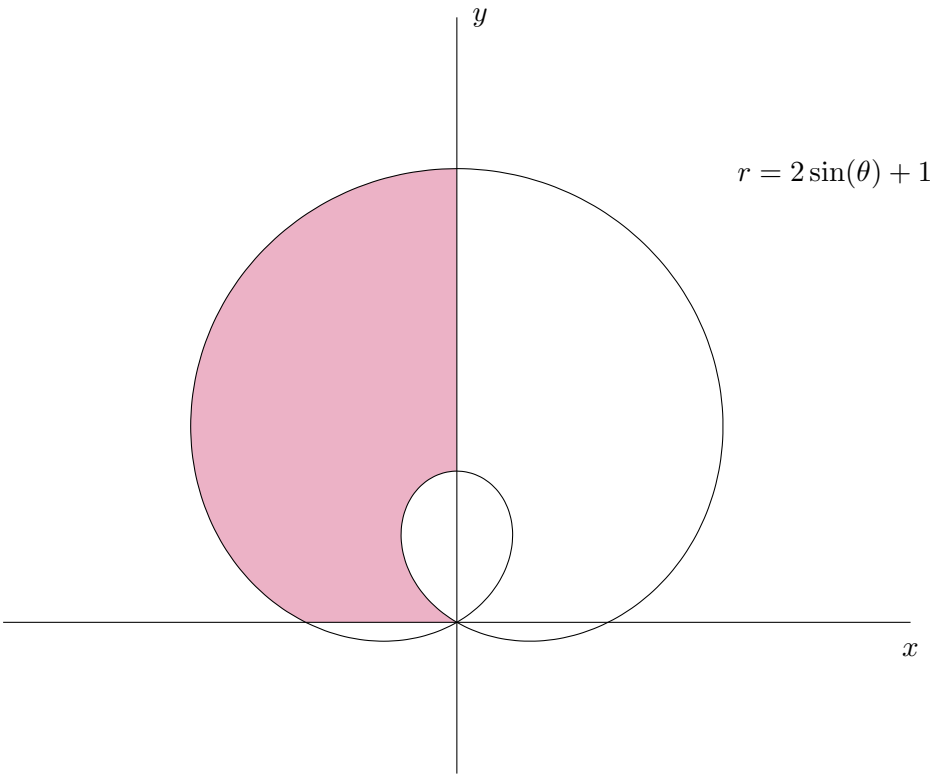
9. [6 points] O-guk is creating a can opener to open his many cans of juice. The opener is in the shape of the shaded region enclosed by the two loops of the polar curve $r = 2\sin(\theta) + 1$ and the x- and y-axes.



Write an expression involving integrals that gives the total area of the shaded region.

Solution:

$$\frac{1}{2}\int_{\frac{\pi}{2}}^{\pi}(2\sin\theta+1)^2\,d\theta - \frac{1}{2}\int_{\frac{3\pi}{2}}^{\frac{11\pi}{6}}(2\sin\theta+1)^2\,d\theta$$