7. [8 points] Roy the alpaca is designing a pool and a deck for his family. The pool has the shape of a cardioid whose equation is given by $r = 4 - 4 \sin(\theta)$ where $r$ is in meters and $\theta$ is a number between 0 and $2\pi$. The deck will be built in the region that lies inside the circle $x^2 + y^2 = 4$ and outside the cardioid. The deck is depicted in the figure as the region enclosed by the solid lines.

![Diagram of pool and deck](image)

a. [1 point] Write the equation for the circle $x^2 + y^2 = 4$ in polar coordinates.

b. [2 points] Find the values of $\theta$ between 0 and $2\pi$ where the cardioid and the circle intersect.

c. [5 points] Write an expression involving integrals that gives the area of the region where the deck will be built. Do not evaluate your expression.