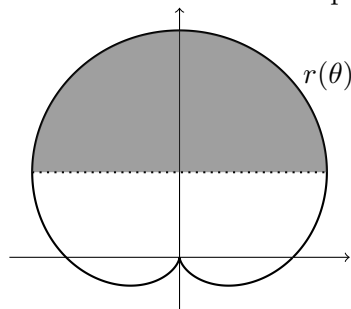


8. [11 points] Franklin, your robot, uses the lasers on his satellites to burn strange shapes in local corn fields. One of these strange shapes is given by the polar equation $r(\theta) = 2 + 2 \sin(\theta)$ where $r(\theta)$ is measured in kilometers. All of the corn **above** the line $y = \frac{3}{2}$ has been pecked away by a flock of wild chickens. The polar curve $r(\theta)$ (solid) and the line $y = \frac{3}{2}$ (dotted) are shown below. The portion of the corn field that has been pecked away is shaded below.



- a. [6 points] Write an expression involving one or more integrals which gives the area of the shaded region. Do not evaluate any integrals. **Include units.**

- b. [5 points] Write an expression involving one or more integrals which gives the perimeter of the shaded region. Do not evaluate any integrals. **Include units.**