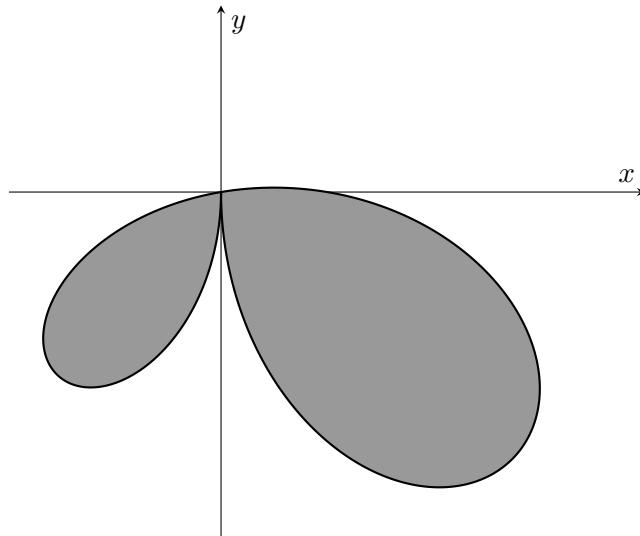


6. [6 points] A graphic designer makes posters for David, a singer who famously used to have a unique haircut. In a poster for an old album, the boundary of David's haircut is given by the polar curve $r(\theta) = \cos(\theta) + 3 \sin(2\theta)$, where $\frac{\pi}{2} \leq \theta \leq \frac{3\pi}{2}$. A graph of the curve is shown below, and David's hair is represented by the shaded region.



a. [2 points] What are the x - and y -coordinates of the curve in terms of θ ?

Answer: $x(\theta) =$ _____

Answer: $y(\theta) =$ _____

b. [2 points] Find $\frac{dx}{d\theta}$ in terms of θ .

Answer: $\frac{dx}{d\theta} =$ _____

c. [2 points] At which of the following values of θ could the above curve have a vertical tangent line? Circle all options that apply.

i. $\theta = \pi/2$

iii. $\theta = 3\pi/2$

ii. $\theta = \pi$

iv. None of the above