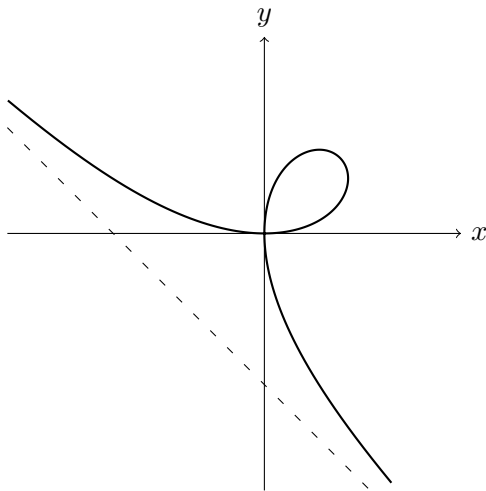**7.** [9 points] For $-\frac{\pi}{4} < \theta < \frac{3\pi}{4}$, consider the polar curve

$$r = \frac{\sin(2\theta)}{\cos(\theta) + \sin(\theta)}.$$

The curve has an asymptote, the dashed line in the picture, as θ approaches $-\frac{\pi}{4}$ and $\frac{3\pi}{4}$.

a. [4 points] Write down, but do **not** evaluate, an integral that gives the area inside the loop in the first quadrant.

b. [2 points] Find a formula for the quantity $x + y$ in terms of the variable θ. Write your answer in the space provided.

$x + y =$ _____

c. [2 points] Find the limit of $x + y$ as $\theta \to \left(\frac{3\pi}{4}\right)^{-}$. No justification is needed.

d. [1 point] Write down the Cartesian equation of the asymptote. No justification is needed.