2. [8 points]

The *castar*, a coin widely used in
Middle-Earth, allegedly has the shape
graphed to the right. The outer perimeter
can be modeled by the implicit equation

$$x^4 + y^4 = 1$$

and the perimeter of the hole in the middle is
a square. To help his fellow Hobbits detect
counterfeit coins, Samwise Gamgee, the
Mayor of the Shire, is working on obtaining
the specifications of a genuine castar. Sam
needs your help.
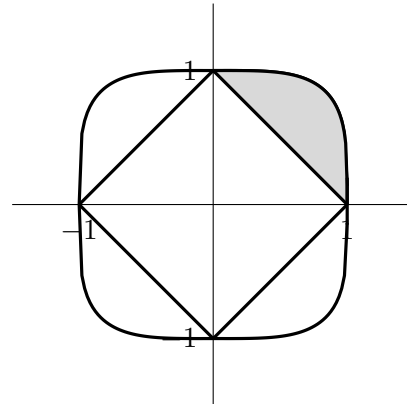
a. [2 points] Find a function $f(\theta)$ so that the outer edge of the castar is given by the
function $r = f(\theta)$.

Answer: $f(\theta) =$ _____

b. [3 points] Write an expression involving one or more integrals that gives the total area of
the quarter of a castar in the first quadrant (shaded above).

Answer: _____

c. [3 points] Approximate the area of a castar by estimating your integral(s) from part (b)
using TRAP(2). Write out all the terms in your sum(s).

Answer: _____