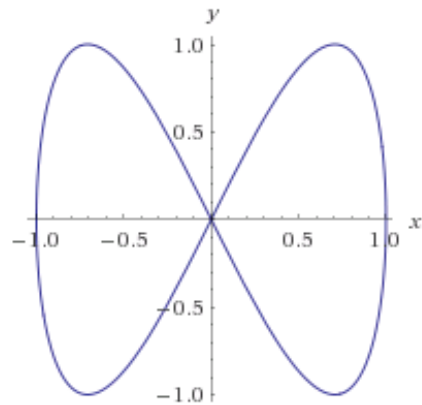


**Quiz 2;** Wednesday, February 3  
**MATH 53** with Professor Stankova  
**Section 116;** 3-4  
**GSI:** Eric Hallman

**Student name:**

You have 10 minutes to complete the quiz. Calculators are not permitted, and remember to show your calculations and explain your reasoning in order to receive full credit.

1. Find the area taken up by the bowtie defined by the curve  $x = \sin t, y = \sin 2t$ .



If we just take the integral from 0 to  $2\pi$ , then we will get zero for an answer. Since we want both areas to be strictly positive, take the integral from zero to  $\pi$  and multiply by 2:

$$\begin{aligned} A &= 2 \int_{t=0}^{\pi} \sin 2t (dx/dt) dt \\ &= 4 \int_{t=0}^{\pi} \sin t \cos^2 t dt \\ &= 4(-\cos^3 t/3)|_0^{\pi} \\ &= 8/3. \end{aligned}$$