Problem statement The thread length for a simple spool of cotton thread is 25 yards. To celebrate Valentine's Day, purchase a spool of red thread and send it to your beloved with these instructions:

> Unwind the thread and arrange it in the shape of a cardioid, $r = A(1-\sin\theta)$. The area of that cardioid represents how much I love you compared to the ordinary Valentine's Day card!

Compute the arclength of $r = A(1 - \sin\theta)$ and find A so that the length is 25 yards. Then compute the area inside that cardioid. Sketch the result.

Comment An opened standard greeting card seems to have area about 70 inches^2, or about .054 yards^2. On sale, a spool of thread costs about 25 cents. A card these days costs several dollars. Isn't the thread more cost-effective?