Length of Polar Curves

Review length of parametric equations =

So given a polar function

 =

 = 1 = 1

Therefore length of a polar equation =



Example 1: Find the length of the cardiod .

The graph starts at and ends at .

So the length = = 8 units

**Calculator short cut**: Enter function in **Y=** r1= .

Then enter the derivative in **Y =** , but have the calculator do the derivative for you. r2 = nDeriv( r1,) nDerive is **Math** 8,

r1 and r2 are found in **VARS**, Y-Vars, Polar

Then integrate the length formula using **Math** 9 using r1 and r2 for r and r’

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Example 2: Find the length of the outer loop of .

Looking at the graph on the calculator, I can see starting at and stopping at the pole (when r = 0) takes me halfway around the outer loop. I need to calculate the exact angle value at the pole, since it is hard to trace to exactly r = 0.

 Store this value

so, the length of ½ the outer loop = = 9.252510543

Whole outer loop = 18.505 units r

Looking at the same graph on a rectangular grid,

you can see the ½ the large loop above the axis, the small

loop below the axis, then the rest of the large loop is above

the axis.

Homework:

p. 697 #33 - 37

 Small loop