

Problem 3: Polygon in the Unit Circle

Let v_1, v_2, \dots, v_n be the vertices of a regular n -gon inscribed in the unit circle. Join the vertex v_1 to v_2, v_3, \dots, v_n by line segments of lengths $\ell_2, \ell_3, \dots, \ell_n$. What is the value of

$$\prod_{k=2}^n \ell_k$$

Hint: Consider the polynomial $P(z) = \frac{z^n - 1}{z - 1}$ and $P(1) = \lim_{z \rightarrow 1} \frac{z^n - 1}{z - 1}$

As always, show your work, fully explain and justify your answer.

Posting Date 2/12/2017. Submit solutions to Noah Aydin, Mathematics Department, RBH 319 (e-mail or hard-copy, but hard copy submissions must include a time stamp) by 4 pm on 2/20/17.