

Problem 12)

$$s = 2R \sin(\theta/2).$$

$$P = ns = 2nR \sin(\theta/2).$$

$$A = nR^2 \sin(\theta/2) \cos(\theta/2).$$

$$A/P = \frac{1}{2}R \cos(\theta/2) = \frac{1}{2}R \cos(\pi/n).$$

For a given value of R , the ratio of area to perimeter is an increasing function of the number n of the sides of the polygon. When $n \rightarrow \infty$ the ratio $A/P \rightarrow R/2$. In this limit, the polygon becomes a circle, whose area and perimeter are $A = \pi R^2$ and $P = 2\pi R$, respectively.
