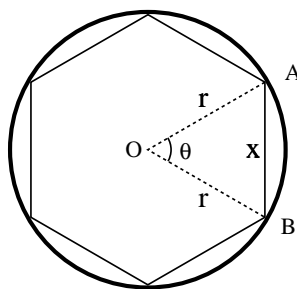


QUIZ 1

Time: 15min

1. Compute the area of a circle of radius r by taking the limit of a sequence of polygonal approximations.

Hints: Consider the following picture. It demonstrates a polygon with n equal edges, of length x , inscribed in a circle of radius r .



- (i) Show that $x = 2r \sin \frac{\theta}{2}$.
- (ii) Show that $h = r \cos \frac{\theta}{2}$, where h is the distance between O and AB .
- (iii) Show that the area of the triangle OAB is $\frac{1}{2}r^2 \sin \theta$.
- (iv) Conclude that the area of the polygon is $n \times (\frac{1}{2}r^2 \sin \frac{2\pi}{n})$.
- (v) Find $\lim_{n \rightarrow \infty} (\frac{1}{2}r^2 n \sin \frac{2\pi}{n})$ (use the substitution $m := \frac{1}{n}$ and apply the L'Hopital's Rule).

Each part is worth 2 points.