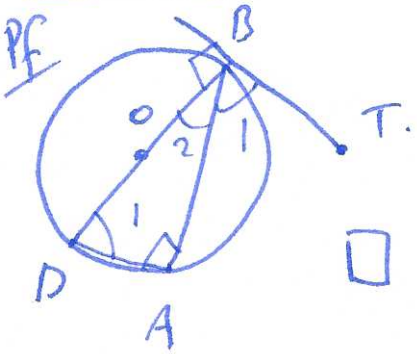
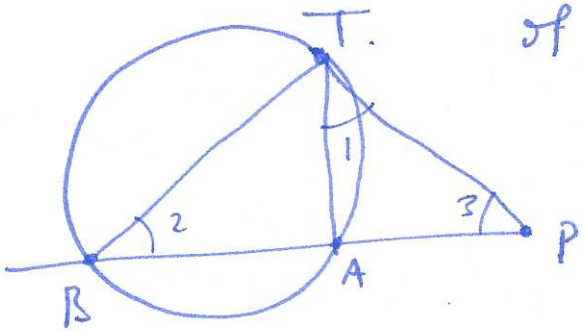
Prop 4.2.4 AB chord, AT tangent iff $\angle TAB$ = angle at circumference of $\overset{\frown}{AB}$.

Pf



□.

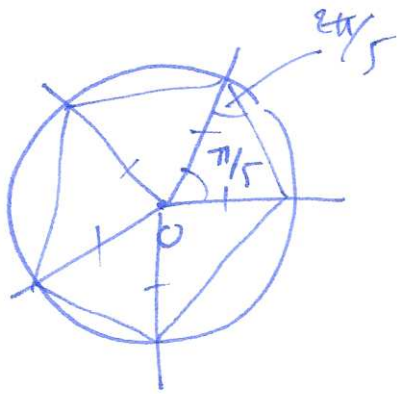


Prop 4.2.5 P point outside circle, PAB secant line. PT tangent iff $|PA||PB| = |PT|^2$

Proof PT tangent iff $\angle 1 = \angle 2$, iff $\triangle TPA$, $\triangle BPT$ similar triangles

so $\frac{|PA|}{|PT|} = \frac{|PT|}{|PB|}$ □.

Construct regular pentagon



construct angle of $\frac{2\pi}{5}$ at O

connect intersection points

- congruent triangles by SAS, so all sides equal.
- angles of triangle equal, so all angles of pentagon equal $\frac{4\pi}{5}$. □.

§4.4 Circle circumference and area

Not in Euclid, we will sketch results.

(4.4.1) Circumference of circle is proportional to radii.

Proof given circles $P_1 = (O_1, r_1)$ $P_2 = (O_2, r_2)$ with circumferences C_1, C_2 respectively, want to show $\frac{C_1}{C_2} = \frac{r_1}{r_2}$.