Homework #6

1. Suppose $ABCDEFG$ is a regular heptagon of side 7. Compute $AC^2 - (DE)(FB)$.

2. On Areas.
Compute the area of the picture on the left given that the angle at the bottom on the left hand side is a right angle.

3. Prove that in any cyclic quadrilateral the angles can be labeled as in the figure. Finish proving that opposite angles always add to $180^\circ$.

4. It is said that Diophantus passed $\frac{1}{6}$ of his life in childhood, $\frac{1}{12}$ in youth, and $\frac{1}{7}$ more as a bachelor. Five years after his marriage was born a son who died 4 years before his father, at $\frac{1}{2}$ his father’s final age. How old was Diophantus when he died?

Bonus.

5. Let $A$, $B$ and $C$ be the points with coordinates $(1,0)$, $(0,0)$ and $(0,1)$. Find the equation of all points $P$ whose total distance to $A$, $B$ and $C$ is $2 + \sqrt{2}$.