Open book: you are allowed to use the textbook and your notes.

Please remember that you are only allowed to use notions and results we had proved in class. “Construct” means “construct using a straightedge and compass”.

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Name: ___________________________  ID #: ___________________________
(please print)
1. Given an angle $\angle AOB$, describe the geometric locus of all the points $P$ inside $\angle AOB$ which satisfy the following condition:

$$d(P, OA) - d(P, OB) = 1 \text{ cm}$$

where $d(P, OA)$ is the distance from $P$ to the line $OA$, and $d(P, OB)$ is the distance from $P$ to the line $OB$. 

![Diagram of angle with points O, A, B, and P]
2. On the sides of triangle $ABC$, points $D, E, F$ are chosen so that
   - $AD$ is the bisector of $\angle A$
   - $CDEF$ is a parallelogram
Prove that then, $AE \cong FC$. 

![Diagram of triangle ABC with points D, E, F drawn on its sides.]
3. Given two circles $C_1, C_2$ so that $C_2$ is inside $C_1$, and a point $P$ on the circle $C_1$, construct a circle which is tangent to $C_1$ at point $P$ and tangent to $C_2$. [You are only required to construct one such circle.]
4. Given a segment $AB$ and a point $M$ on this segment, construct a point $P$ such that $\angle APB = 30^\circ$ and $PM$ is the bisector of angle $\angle P$. 