1. A subset $Y \subset X$ of a scheme is called **constructible** if it is a finite union of locally closed subsets. Show that if $f : X \to Y$ is a morphism of quasi-projective varieties, then $f(X)$ is constructible. (This is known as Chevalley’s Theorem).

2. Show that an open immersion is flat. (A morphism $f : X \to Y$ is flat if $\mathcal{O}_X$ is flat over $Y$).

3. Let $f : X \to Y$ be as above and assume that $f$ is flat. Show that $f$ is an open map.

4. Let $X = \mathbb{A}^1$ and $Y = \mathbb{A}^2$ and let $f : X \to Y$ be given by $t \mapsto (t^n, t^{n+1})$, for some $n$. Describe the flattening stratification of $Y$ for the sheaf $\mathcal{O}_X$, for $n = 2, 3$.

5. Find the smallest integer $m$ so that $T_{\mathbb{P}^n}$ is $m$-regular, where $T_{\mathbb{P}^n}$ is the tangent bundle of $\mathbb{P}^n$.

6. Let $X \subset \mathbb{P}^n$ be a smooth projective curve of degree $d$ and genus $g$. Given an integer $r$ find the smallest integer $m$ so that for any line bundle $L$ on $X$ of degree $r$, $L$ is $m$-regular.