EXERCISES FOR MA8203 ALGEBRAIC GEOMETRY

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The numbered exercises come from Daniel Perrin's textbook.

Chapter I Exercises. Due 1 February

- 1
- 2
- 7, assume k is infinite
- 8

Chapter II Exercises. Due 1 March

- 1
- 5: you can use Macaulay2 to help find the resolution in part (c)

Chapter III Exercises. Due 15 March

- Exercises about sheaves from class.
  (1) Let $\mathcal{F}$ be a sheaf on a topological space X and let $U \subseteq X$ be open. Show that $\mathcal{F}|_U$ is a sheaf on U.
  (2) Let $\pi : X \to Y$ be a continuous map of topological spaces and let $\mathcal{F}$ be a sheaf on X. Show that $\pi_*\mathcal{F}$, defined by $\pi_*\mathcal{F}(V) = \mathcal{F}(\pi^{-1}(V))$, is a sheaf on Y.
  (3) Let $\mathcal{F}$ be a sheaf of rings on a topological space X.
    (a) If $p \in X$, show that $\mathcal{F}_p$ is a ring.
    (b) If $(X, \mathcal{O}_X)$ is a ringed space, and $\mathcal{F}$ is an $\mathcal{O}_X$-module, show that $\mathcal{F}_p$ is an $\mathcal{O}_{X,p}$-module.
  (4) Show that a sequence $\mathcal{F}' \to \mathcal{F} \to \mathcal{F}''$ of sheaves of abelian groups on X is exact if and only if $\mathcal{F}'(U) \to \mathcal{F}(U) \to \mathcal{F}''(U)$ is exact for every open set $U \subseteq X$.
- Exercises A, 1
- ...more to come