1. Show that an object P is projective if and only if $\mathrm{Hom}(P, -)$ is exact.
2. Show that P is projective if and only if every epimorphism $Q \to P$ is split.
3. Prove that the ideal $(2, 1+\sqrt{-5}) \subset \mathbf{Z}[\sqrt{-5}]$ is projective. Can you show it is not free?
4. Prove that the ideal $(x, y) \subset \mathbf{C}[x, y]/(y^2 - x^3 - x)$ is projective. Can you show it is not free?
5. Let M be the $\mathbf{C}[x, y]$-module $\mathbf{C}$, on which x and y both act by 0. Compute $\mathrm{Tor}_n(M, M)$ for all integers n.
6. Prove that if A and B are abelian groups, $\mathrm{Tor}_n(A, B) = 0$ for all $n \neq 0, 1$.
7. Do exercise 2.2.3 from Weibel.
8. Exercise 2.2.1 from Weibel is interesting but not essential.