For each of the following, either give an example, or else prove that none exists.

1. A $\mathbb{Z}$-module that is not flat.
2. A non-zero finitely generated module M over the local ring $\mathbb{Z}_{(2)}$ such that $2M = M$.
3. A commutative ring R, an R-module M, and a surjective homomorphism $N' \to N$ of R-modules such that $\mathrm{Hom}_R(M, N') \to \mathrm{Hom}_R(M, N)$ is not surjective.
4. A finitely generated torsion-free $\mathbb{Z}$-module that is not projective.
5. A flat $\mathbb{C}[x]$-module that is not faithfully flat.
6. A Noetherian ring R such that $R[x, y]$ is not Noetherian.
7. A prime ideal in $\mathbb{C}[x, y, z]/(z^2 - xy)$ of height 3.
8. A maximal ideal in $\mathbb{Q}[x, y]$ that is not of the form $(x - a, y - b)$ with $a, b \in \mathbb{Q}$.
9. A Dedekind domain R such that $R[x]$ is a Dedekind domain.
10. A non-trivial integral ring extension of $\mathbb{Z}$ that is contained in $\mathbb{Q}$.
11. Two unequal field extensions E, F of $\mathbb{Q}$, each of degree 3 and contained in $\bar{\mathbb{Q}}$, such that the compositum EF does not have degree 9 over $\mathbb{Q}$.
12. A Galois field extension E of $\mathbb{F}_4$ such that $\mathrm{Gal}(E/\mathbb{F}_4)$ is isomorphic to $\mathbb{Z}/2 \times \mathbb{Z}/2$.
13. A Galois field extension of $\mathbb{C}((x))$ having degree equal to 8.
14. A Galois field extension L/K of degree 5 such that no non-zero element of L has trace equal to 0.
15. An irreducible polynomial $f(x) \in \mathbb{Q}[x]$ whose splitting field has degree 24 over $\mathbb{Q}$, such that f is not solvable by radicals.