[1] Given integer $n > 1$, exhibit a non-abelian group of order $n^3$.

[2] Show that $\mathbb{Z} \oplus \mathbb{Z}$ modulo the subgroup $\mathbb{Z} \cdot (13, 27)$ is isomorphic to $\mathbb{Z}$.

[3] Let $S, T$ be linear operators on a finite-dimensional complex vectorspace, $S^5 = 1$ and $T^7 = 1$, and with $ST = TS$. Show that there is a basis consisting of eigenvectors for both $S$ and $T$.

[4] Show that the ideal in $\mathbb{Q}[x, y]$ generated by $x$ and $y$ is maximal.

[5] Show that $x^4 + 1$ is reducible in $\mathbb{F}_p[x]$ for every prime $p$.

[6] Let $\omega$ be a primitive seventh root of unity. Show that $\sqrt{-7} \in \mathbb{Q}(\omega)$.

[7] Show that $\mathbb{Z}[i]/\langle 2 + i \rangle$ and and $\mathbb{Z}[i]/\langle 2 - i \rangle$ are non-isomorphic $\mathbb{Z}[i]$-modules.