1. Prove the following addition theorem for the Weierstrass \( \wp \)-function:

\[
\wp(a + b) + \wp(a) + \wp(b) = \frac{1}{4} \left( \frac{\wp'(a) - \wp'(b)}{\wp(a) - \wp(b)} \right)^2.
\]

2. Deduce that the (non-singular, projective) elliptic curve \( C \) with equation

\[
w^2 = 4z^3 - g_2z - g_3
\]

is a group with respect to the following addition operation: if \( A, B \in C \), let \( C' \in C \) be the third intersection point of the line through \( A, B \) with \( C \) (counting multiplicity), and let \( C = A + B \) be the reflection of \( C' \) in the \( z \)-axis \( (w \mapsto -w) \). The identity element is the point at infinity, and a line through infinity is a vertical line \( z = \text{constant} \).