1. Prove by mathematical induction that
\[
\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}
\]

2. Write out the set \(2^{\{a, b, c\}} - 2^{\{a, b\}}\). Recall that \(2^S\) denotes the power set of \(S\), i.e., the set of all subsets of \(S\).

3. True or false? Briefly justify your answers. (Your justification should be of the form, e.g., "\(x\) is the third element on the right hand side", or "both \(x\) and \(y\) appear on the right hand side; they are the second and third elements, respectively".)

(a) \(\{0, 1\} \in \{0, 1, \{0, 1\}\}\)
(b) \(\{0, 1\} \subseteq \{0, 1, \{0, 1\}\}\)
(c) \(\{a, b\} \subseteq 2^{\{a, b, \{a,b\}\}}\)
(d) \(\{a, b\} \in 2^{\{a, b, \{a,b\}\}}\)
(e) \(\{\{a, b\}\} \in 2^{\{a, b, \{a,b\}\}}\)