1[10] Prove that the following three expressions are equivalent.
\[
\begin{align*}
\text{if } x \text{ then } y \text{ else } z \\
\text{if } y \text{ then } z \lor x \text{ else } z \lor x \\
\text{if } z \text{ then } x \leq y \text{ else } x \wedge y
\end{align*}
\]

2[10] Find the simplest circuit you can that's equivalent to the following circuit.

3[5] Prove that △ is complete.

4[10] Prove that ⊕ is not complete. Hint: Find a systematic way to show all functions that can be created from ⊕, and show some function that is not created. Or find a property of all functions that can be created from ⊕, and show some function that does not have that property.

5[15] Design a circuit whose 4 bits of input represent a number x from 0 to 15, and whose bits of output represent two numbers y and z such that \( x = y \times z \) and \( y \geq z \), and of all pairs whose product is x, the pair y and z has the smallest sum.