**Exercises**

E4.d.11 [26X] If $\leq$ is a total order on $\mathbb{N}$ then these are equivalent

$$\forall x, y \in \mathbb{N}, (x \leq y \leq Sx) \Rightarrow (x = y \lor y = Sx) \quad , \qquad (4.d.12)$$

$$\forall x, y \in \mathbb{N}, (x < Sy) \iff (x \leq y) \quad ; \qquad (\text{ as in } [(4.29)])$$

$$\forall x, y \in \mathbb{N}, (x < y) \iff (Sx \leq y) \quad . \qquad (4.d.13)$$

Note the analogy with [239]

**Solution 1.** [296]