1. At the top of page 4 in the notes on lazy weight-balanced trees, it is claimed that “after rebuilding all imbalances are zero in the subtree”. Prove this statement.

2. Redo the amortized analysis of insertion/deletion in lazy weight-balanced trees with

\[ I(x) = |\text{size}(\text{left}(x)) - \text{size}(\text{right}(x))| \]

in the potential function.

3. **PhD Qualifying Exam Section Problem 6.** In the last section of the notes on lazy weight-balanced trees the possibility of coping without the size and height fields is discussed. Give detailed algorithms and amortized analyses for the method described there.

4. Problem 19.4-1 on page 526 of CLRS3.

5. **PhD Qualifying Exam Section Problem 7.** Problem 19.4-2 on page 526 of CLRS3 (don’t forget the case \( k = 1 \)). Give amortized time bounds for all Fibonacci heap operations as a function of \( k \).