Exercise 1 (Parallel Scalar)

Write a parallel program that computes the scalar product of two vectors (stored in two arrays). Discuss the runtime complexity on the EREW PRAM model. How many processors can be used?

Exercise 2 (Parallel Vector)

Extend the program of exercise 1 to compute a matrix-vector product. Again, discuss the runtime complexity on the EREW PRAM and state the number of processors that are used.

Exercise 3 (Parallel Optimization)

Given the following parallel algorithm PrefixPRAM for prefix multiplication (with EREW-PRAM).

Algorithm 1: PrefixPRAM

```
Input: A: Array[1..2^k]
"tmp ← Array[1..2^k];
for l = 0 to k - 1 do
    for j = 2^l + 1 to n in parallel do
        "tmp[j] ← A[j - 2^l];
    "end
end
```

Assume that the j-loop of the above program is changed to a sequential loop. State why the resulting algorithm is no longer correct, and suggest how to change the j-loop to obtain a correct sequential implementation. Also, state why the parallel loop works correctly.