Assignment 1. *Design a cost-optimal version of the prefix sums algorithm (Problem 5.10) for computing all prefix-sums of n numbers on p processing elements where $p < n$. Derive expressions for parallel runtime T_p, speedup S, efficiency E, cost c and the isoefficiency function W. Assuming that adding two numbers takes one unit of time and that communicating one number between two processing elements takes 10 units of time.*

Assignment 2. *Consider the simple matrix multiplication algorithm (Section 8.2.1) for multiplying two $n \times n$ matrices using p processes. Assume that the submatrices are multiplied using Strassen's algorithm at each process. Derive an expression for the parallel runtime of this algorithm. Is it cost-optimal?*

Assignment 3. *Derive expression for minimal parallel runtime T_p^{min}, isoefficiency function W and total overhead T_o for edge detection on images:*
a) 1-D edge detection
b) 2-D edge detection

Assignment 4. *Assume parallel formulation of the bitonic sort algorithm. Let p be the number of processes and n be the number of elements to be sorted, such that $p < n$. Each process is assigned a block of n/p elements and cooperates with the other processes to sort them. Derive parallel runtime, the maximum number of processors that can be used cost efficiently and the corresponding runtime, and the isoefficiency function. Assume a hypercube architecture.*

Assignment 5. *Parallel runtime T_p of the FFT algorithm implemented with p processing elements used in parallel is given by $T_p = (n/p)\log n + t_w(n/p)\log p$ for an input sequence of length n. The maximum number of processing elements that the algorithm can use for n-point FFT is n. What is the number of processors when T_p is minimal and what is the minimal T_p for $t_w = 10$?*