

## Homework 3

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You will not hand in the answers to this homework assignment. Instead, at the beginning of class on **9 April 2003** you will be asked to solve one of the problems as a closed notes, closed book quiz. The question to be solved will be randomly selected.

1. A process has a three frames allocated to it. The frames are initially empty, and the process generates the following page reference string: (1 2 3 4 2 1 5 2). For LRU replacement, state the number of page faults and the final contents of the three frames.

What is the least number of page faults possible, and why?

2. For the same situation as in the previous problem, for FIFO replacement, state the number of page faults and the final contents of the three physical pages.

What is the least number of page faults possible, and why?

3. Define spatial locality and temporal locality. If a program has a data space much larger than main memory, how will a lack of spatial locality affect its performance? In other words, will it slow down or speed up, and why. For this question, ignore caching, and consider only main memory management.

4. Define both internal and external fragmentation. Draw a pictorial representation of a pure paging system (not paged segmentation, or segmented paging, but just plain paging) which demonstrates internal fragmentation. Draw a pictorial representation of a pure segmentation system which demonstrates external fragmentation.

5. In a paging system, page boundaries are transparent to the programmer. Explain how a loop might cause thrashing in a static allocation paging system when the memory allocation is too small.

6. A student in a compiler course proposes to the professor a project of writing a compiler that will produce a list of page references that can be used to implement the optimal page replacement algorithm. Is this possible? Why or why not?