Question 1 (20 points): Provide concise answers to the following question.

1. (**5 points**) What were two important motivations for the creation of virtual-memory systems in computers?

2. (**5 points**) Consider two cache-memory designs with the same cache storage capacity. What is the relationship between the associativity of the cache and the number of bits used for indexing the cache?

3. (**5 points**) Consider the following sequence of MIPS instructions:

```
lw    $t0, 0($a0)
addi  $t1, $t0, 4
```

   When these two instructions are executed in sequence in a five-stage MIPS pipeline there will be a delay, also referred to as a bubble, in the pipeline execution. Explain why.

4. (**5 points**) Given the following C-language code

```
indCopy(int **p, int **q){
**p = **q;
}
```

Assume that `p` and `q` are in `$a0` and `$a1`, respectively, when the `indCopy` function starts executing. How many load instructions and how many store instructions are needed to execute this function?