Homework 08

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1. On a computer of your choice (Linux or Windows WSL, note that MacOSX has different commands):

   (a) Determine the name/vendor of the CPU you have. What is the number of **physical cores**? Does it support hyperthreading? What is the maximum frequency?

   (b) Compute the theoretical limit for the number of operations the CPU could do per second (like integer adds that take 1 cycle). You will need to ignore hyperthreading for that.

   (c) Report L1,L2,L3 cache sizes

   Hint: Look at the file `/proc/cpuinfo` (using `less`) and at the output of `lscpu` (report the relevant information for the questions above).

2. Based on `matrix-speed.cpp` (and using `timer.h`), compare the performance of creating and traversing a doubly-linked list vs a dynamic array:

   - Create a `std::list` of `double`'s (you will need to `#include <list>`).
   - Fill the list with 1,000,000 entries (use the values 0,1,2, etc.). Measure the time it takes and report this in seconds.
   - Compute the sum of all entries by looping over them. Measure the time this takes in seconds. Hint: this might be too fast to measure reliably, what you can do is compute the sum 100 times in a loop and divide the time by 100.
   - Repeat the whole process with a `std::vector`.
   - Finally, compute the total amount of memory used by the two data structures (a pointer is 8 bytes, a double is 8 bytes as well) and show the total (this is a simple formula one could do on paper).