Exercise 01b - Theory Answers

1. **Show the formula for Speed up. Did you get one and/or think you should have gotten one? Why or why not?**

The formula for speedup is: Speedup = $\frac{t_{serial}}{t_{parallel}}$, where t_{serial} is the execution time of the serial program and $t_{parallel}$ is the execution time of the parallel program. I thought I would see some speedup, but in fact, I did not see it. It actually was a little bit slower. After further investigating and exploring I came to the conclusion that it might not be linear (i.e., 3x faster with 3 processes) due to communication overhead and other factors, for example.

2. **Explain the main difference between weak and strong scaling.**

- Strong Scaling is the speedup for a fixed problem size with respect to the number of processors (Amdahl's law).
- Weak Scaling is the speedup for a scaled problem size with respect to the number of processors (Gustafson's law).

3. **Explain the differences between SIMD and SPMD. Which one is MPI?**

- SIMD (Single Instruction, Multiple Data): All processors execute the same instruction at each step, but on different data.
- SPMD (Single Program, Multiple Data): All processors run the same program, but may execute different instructions on different data. MPI belongs to this category.