Homework 3

Due: Wednesday 2/3 at the beginning of class

Complete the following problems and submit them on paper or via email.

1. (5 points) Use Amdahl's law to compute the speedup for programs with different amounts of inherently serial code on \( p = 1, 2, 3, 4, \ldots, 10 \) processors. Do this for jobs that are 50%, 25%, 10%, and 1% inherently serial. Plot your results as four line-connected series of dots.

2. (5 points) Draw the dependence graph corresponding with the following program:

```java
public class Program {
    public class T1 extends SimpleTask {
        public void run() {
            A();
            se.submit(new T2());
        }
    }

    public class T2 extends SimpleTask {
        public void run() {
            B();
        }
    }

    private SimpleExecutor se;

    public Program() {
        se = new SimpleExecutor();
    }

    public void runIt() {
        SimpleTask t = new T1();
        se.submit(t);
        C();
        t.finish();
        D();
        se.terminate();
        E();
    }

    public static void main(String[] args) {
        Program p = new Program();
        p.runIt();
    }
}
```

The vertices should be the functions \( A, B \), etc rather than the tasks.

3. (5 points) Using Java threads, write pseudocode realizing the following dependence graph:
4. (5 points) Exercise 2.1 of the text (page 100; bisection bandwidth of a $n \times m$ mesh). Give an exact formula in terms of $n$ and $m$. You may assume $n \geq m$, but there remain several cases that must be considered.