Assignment 1.

Due Tuesday, Apr. 3.

Reading: Ch. 1.

1. Write a paragraph about some phenomenon you have observed that you think might be explained mathematically. Explain what patterns you have observed and any ideas that you have about mathematical formulas that might describe them. [I am not looking for a polished analysis here, just want you to start thinking about mathematical modeling and about how to express your ideas clearly.]

2. A scientist observes that initially a tree has 1 branch, after one month it still has only 1 branch, after two months it has 2 branches, and after three months it has 3 branches. He notes that these are the first four Fibonacci numbers—$F_0 = 1$, $F_1 = 1$, $F_2 = 2$, and $F_3 = 3$—and conjectures that the number of branches follows a Fibonacci sequence. Another scientist observes that the number of branches also obeys a cubic polynomial law:

$$\# \text{ branches} = P(n) = c_0 + c_1n + c_2n^2 + c_3n^3,$$

for certain coefficients $c_0$, $c_1$, $c_2$, and $c_3$. Determine the cubic polynomial $P(n)$ that satisfies $P(n) = F_n$ for $n = 0, 1, 2, 3$.

How might you decide which, if either, of the scientists has the correct model?

3. Exercise 2 of Chapter 1.