Extra Exercises for Chapter 4. Accumulating the Flows

1. Complete a Simulation

The stock in Figure 1 represents the volume of water stored in a tank. Volume is measured in gallons; the flows are measured in gallons per second. Suppose we initialize the stock at 2 gallons, and we set the flows as shown on the graph in Figure 2.

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Figure 1. Flows of water into and out of a tank.

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Figure 2. Graph of model results, but the volume of water in tank is missing.

Figure 2 shows a graph for of the two flows. But the graph does not show the volume of water in the tank. You should be able to simulate the model in your head. During the first second for example, the volume will grow from 2 to 6 gallons. Continue with the simple numerical integration to determine how many gallons of water will be in the tank by the end of the simulation.
2. Complete another Simulation

The population shown in Figure 3 is measured in millions of people. The flows are measured in million people per year. Suppose we initialize the stock at 8 million people, and we set the flows as shown on the graph in Figure 4. The graph does not show the population, but you should be able to simulate the model in your head. During the first year for example, the population will decline from 8 to 6 million. Continue with the simple numerical integration to determine the size of the population at the end of the simulation.

Figure 3. Population model.

Figure 4. Graph of model results, but the population is missing.