ICE for Week 7

Problem 1

Use **subplot** to show the difference between the **sin** and **cos** functions. Create an x vector with 100 linearly spaced points in the range from -2π to 2π, and then two y vectors for **sin(x)** and **cos(x)**. In a 2×1 **subplot**, use the **plot** function to display them, with appropriate titles.

Problem 2

Write a script that will plot the **sin** function three times in one Figure Window, using the colors red, green, and blue.

Problem 3

When an object with an initial temperature T is placed in a substance that has a temperature S, according to Newton's law of cooling, in t minutes it will reach a temperature T_t using the formula $T_t = S + (T - S)\, e^{(-kt)}$, where k is a constant value that depends on properties of the object. For an initial temperature of 100 and k = 0.6, graphically display the resulting temperatures from 1 to 10 minutes for two different surrounding temperatures: 50 and 20. Use the **plot** function to plot two different lines for these surrounding temperatures, and store the handle in a variable. Notice that two function handles are actually returned, and stored in a vector. Use **set** to change the line width of one of the lines.

Problem 4

Experiment with the **comet3** function: Try the example given when **help comet3** is entered and then animate your own function using **comet3**.

Problem 5

Draw a graph of the population of the USA from 1790 to 2000, using the (logistic) model:

$$P(t) = \frac{197,273,000}{1 + e^{-0.03134(t-1913.25)}}$$

where t is the date in years.

Actual data (in 1000s) for every decade from 1790 to 1950 are as follows: 3929, 5308, 7240, 9638, 12,866, 17,069, 23,192, 31,443, 38,558, 50,156, 62,948, 75,995, 91,972, 105,711, 122,775, 131,669, 150,697. Superimpose this data on the graph of $P(t)$. Plot the data as discrete circles (i.e., do not join them with lines) as shown in Figure 9.16.

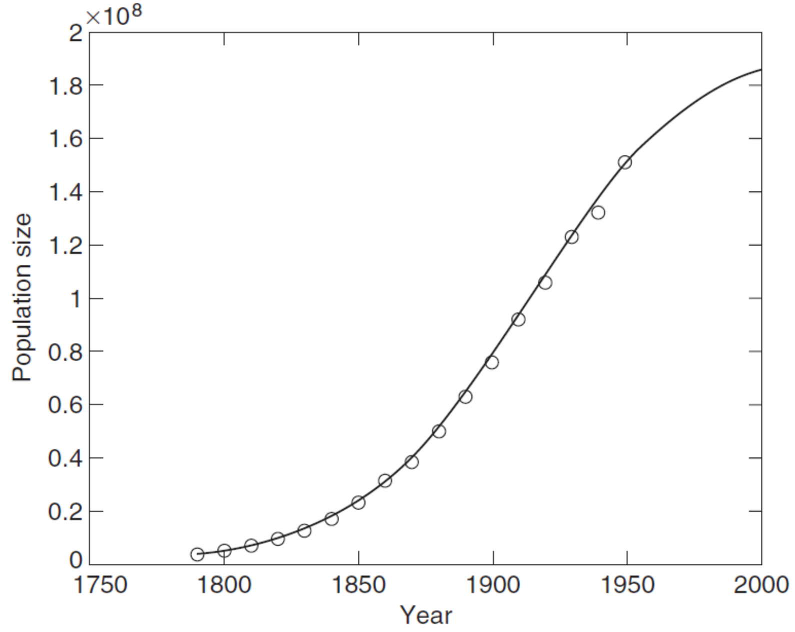

FIGURE 9.16 USA population: model and census data (○).

Problem 6

The Spiral of Archimedes (Figure 9.17) may be represented in polar coordinates by the equation:

$$r = a\theta,$$

where a is some constant. (The shells of a class of animals called nummulites grow in this way.) Write some command-line statements to draw the spiral for some values of a.

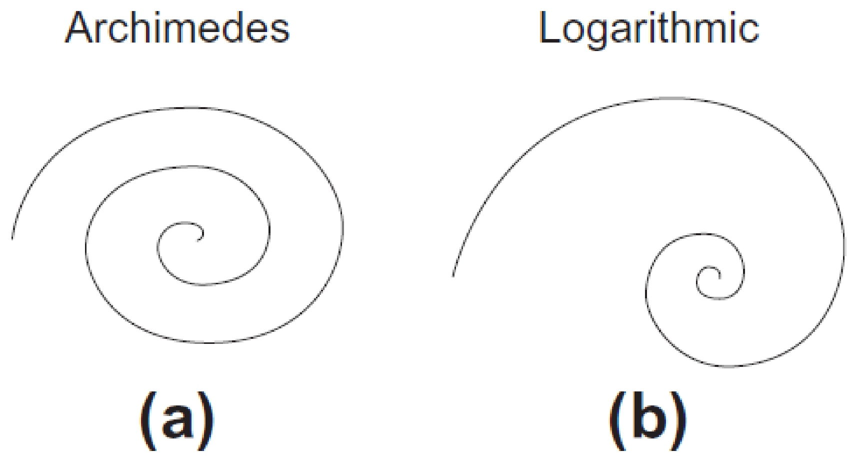

FIGURE 9.17 Spirals.

Problem 7

Another type of spiral is the *logarithmic* spiral (Figure 9.17), which describes the growth of shells of animals like the periwinkle and the nautilus. Its equation in polar co-ordinates is:

$$r = aq^{\theta},$$

where $a > 0$, $q > 1$. Draw this spiral.

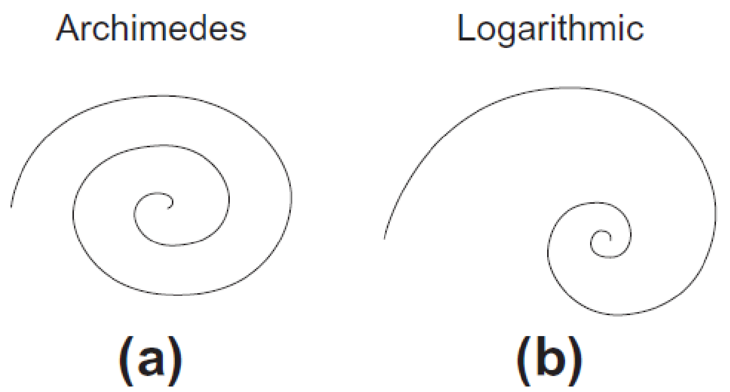

FIGURE 9.17 Spirals.