1. Find roots of equation $ax^2 + bx + c = 0$

2.

2.22. The electricity accounts of residents in a very small town are calculated as follows:

- If 500 units or fewer are used, the cost is 2 cents per unit.
- If more than 500 but not more than 1000 units are used, the cost is \$10 for the first 500 units and 5 cents for every unit in excess of 500.
- If more than 1000 units are used, the cost is \$35 for the first 1000 units plus 10 cents for every unit in excess of 1000.
- A basic service fee of \$5 is charged, no matter how much electricity is used.

Write a program that enters the following five consumptions into a vector and uses a `for` loop to calculate and display the total charge for each one: 200, 500, 700, 1000, 1500. (Answers: \$9, \$15, \$25, \$40, \$90)

3.

2.25. A plumber opens a savings account with \$100,000 at the beginning of January. He then makes a deposit of \$1000 at the end of each month for the next 12 months (starting at the end of January). Interest is calculated and added to his account at the end of each month (before the \$1000 deposit is made). The monthly interest rate depends on the amount A in his account at the time interest is calculated, in the following way:

$$\begin{aligned} A \leq 1\,10\,000 &: \quad 1\% \\ 1\,10\,000 < A \leq 1\,25\,000 &: \quad 1.5\% \\ A > 1\,25\,000 &: \quad 2\% \end{aligned}$$

Write a program that displays, under suitable headings, for each of the 12 months, the situation at the end of the month as follows: the number of the month, the interest rate, the amount of interest, and the new balance. (Answer: Values in the last row of output should be 12, 0.02, 2534.58, 130263.78).

4.

2.26. It has been suggested that the population of the United States may be modeled by the formula

$$P(t) = \frac{19\,72\,73\,000}{1 + e^{-0.03134(t-1913.25)}}$$

where t is the date in years. Write a program to compute and display the population every *ten* years from 1790 to 2000. Try to plot a graph of the population against time as well (Figure 7.14 shows this graph compared with actual data). Use your program to find out if the population ever reaches a "steady state" (i.e., stops changing).

5.

2.27. A mortgage bond (loan) of amount L is obtained to buy a house. The interest rate r is 15%. The fixed monthly payment P that will pay off the bond loan over N years is given by the formula

$$P = \frac{rL(1 + r/12)^{12N}}{12[(1 + r/12)^{12N} - 1]}$$

(a) Write a program to compute and print P if $N = 20$ and the bond is for $50,000. You should get $658.39.

(b) See how P changes with N by running the program for different values of N (use `input`). Can you find a value for which the payment is less than $625?

(c) Go back to $N = 20$ and examine the effect of different interest rates. You should see that raising the interest rate by 1% (0.01) increases the monthly payment by about $37.

6. plot a graph of $z(x, y) = \sqrt{x^2 + y^2}$