An alternative simple way to change the current folder is to use the `cd` command in the Command Window. To change the current folder to a different drive, type `cd`, space, and then the name of the directory followed by a colon : and press the **Enter** key. For example, to change the current folder to drive E (e.g., the flash drive) type `cd  E:`. If the script file is saved in a folder within a drive, the path to that folder has to be specified. This is done by typing the path as a string in the `cd` command. For example, `cd('E:\Chapter 1')` sets the path to the folder Chapter 1 in drive F. The following example shows how the current folder is changed to be drive E. Then the script file from Figure 1-7, which was saved in drive E as ProgramExample.m, is executed by typing the name of the file and pressing the **Enter** key.

```
>> cd('E:\Chapter 1')
>> Chap1_Examp1
x1 =
    3.5000
x2 =
   -1.2500
```

The current directory is changed to drive E.

The script file is executed by typing the name of the file and pressing the **Enter** key.

The output generated by the script file (the roots `x1` and `x2`) is displayed in the Command Window.

1.9 *Examples of MATLAB Applications*

Sample Problem 1-1: Trigonometric identity

A trigonometric identity is given by:

$$\cos^2\frac{x}{2} = \frac{\tan x + \sin x}{2\tan x}$$

Verify that the identity is correct by calculating each side of the equation, substituting $x = \frac{\pi}{5}$.

Solution

The problem is solved by typing the following commands in the Command Window.

```
>> x=pi/5;
>> LHS=cos(x/2)^2
LHS =
    0.9045
>> RHS=(tan(x)+sin(x))/(2*tan(x))
RHS =
    0.9045
```

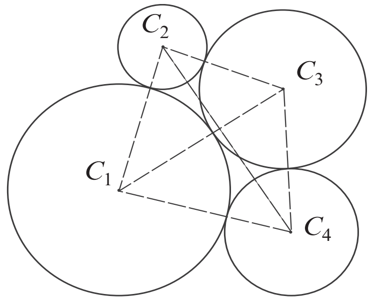
Define `x`.

Calculate the left-hand side.

Calculate the right-hand side.

Sample Problem 1-2: Geometry and trigonometry

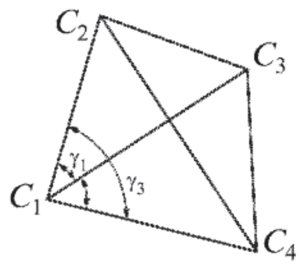
Four circles are placed as shown in the figure. At each point where two circles are in contact, they are tangent to each other. Determine the distance between the centers C_2 and C_4.



The radii of the circles are:
$R_1 = 16$ mm, $R_2 = 6.5$ mm, $R_3 = 12$ mm, and $R_4 = 9.5$ mm.

Solution

The lines that connect the centers of the circles create four triangles. In two of the triangles, $\Delta C_1C_2C_3$ and $\Delta C_1C_3C_4$, the lengths of all the sides are known. This information is used to calculate the angles γ_1 and γ_2 in these triangles by using the law of cosines. For example, γ_1 is calculated from:



$$(C_2C_3)^2 = (C_1C_2)^2 + (C_1C_3)^2 - (C_1C_2)(C_1C_3)\cos\gamma_1$$

Next, the length of the side C_2C_4 is calculated by considering the triangle $\Delta C_1C_2C_4$. This is done, again, by using the law of cosines (the lengths C_1C_2 and C_1C_4 are known and the angle γ_3 is the sum of the angles γ_1 and γ_2).

The problem is solved by writing the following program in a script file:

```
% Solution of Sample Problem 1-2
R1=16; R2=6.5; R3=12; R4=9.5;
C1C2=R1+R2; C1C3=R1+R3; C1C4=R1+R4;
C2C3=R2+R3; C3C4=R3+R4;
Gama1=acos((C1C2^2+C1C3^2-C2C3^2)/(2*C1C2*C1C3));
Gama2=acos((C1C3^2+C1C4^2-C3C4^2)/(2*C1C3*C1C4));
Gama3=Gama1+Gama2;

C2C4=sqrt(C1C2^2+C1C4^2-2*C1C2*C1C4*cos(Gama3))
```

Define the R's.

Calculate the lengths of the sides.

Calculate γ_1, γ_2, and γ_3.

Calculate the length of side C_2C_4.

When the script file is executed, the following (the value of the variable `C2C4`) is displayed in the Command Window:

```
C2C4 =
   33.5051
```

Sample Problem 1-3: Heat transfer

An object with an initial temperature of T_0 that is placed at time $t = 0$ inside a chamber that has a constant temperature of T_S will experience a temperature change according to the equation

$$T = T_S + (T_0 - T_S)e^{-kt}$$

where T is the temperature of the object at time t, and k is a constant. A soda can at a temperature of 120° F (after being left in the car) is placed inside a refrigerator where the temperature is 38° F. Determine, to the nearest degree, the temperature of the can after three hours. Assume $k = 0.45$. First define all of the variables and then calculate the temperature using one MATLAB command.

Solution

The problem is solved by typing the following commands in the Command Window.

```
>> Ts=38;  T0=120; k=0.45; t=3;

>> T=round(Ts+(T0-Ts)*exp(-k*t))

T =
    59
```

Round to the nearest integer.

Sample Problem 1-4: Compounded interest

The balance B of a savings account after t years when a principal P is invested at an annual interest rate r and the interest is compounded n times a year is given by:

$$B = P\left(1 + \frac{r}{n}\right)^{nt} \qquad (1)$$

If the interest is compounded yearly, the balance is given by:

$$B = P(1 - r)^t \qquad (2)$$

Suppose \$5,000 is invested for 17 years in one account for which the interest is compounded yearly. In addition, \$5,000 is invested in a second account in which the interest is compounded monthly. In both accounts the interest rate is 8.5%. Use MATLAB to determine how long (in years and months) it would take for the balance in the second account to be the same as the balance of the first account after 17 years.

Solution

Follow these steps:

(*a*) Calculate B for \$5,000 invested in a yearly compounded interest account after 17 years using Equation (2).

(*b*) Calculate t for the B calculated in part (*a*), from the monthly compounded