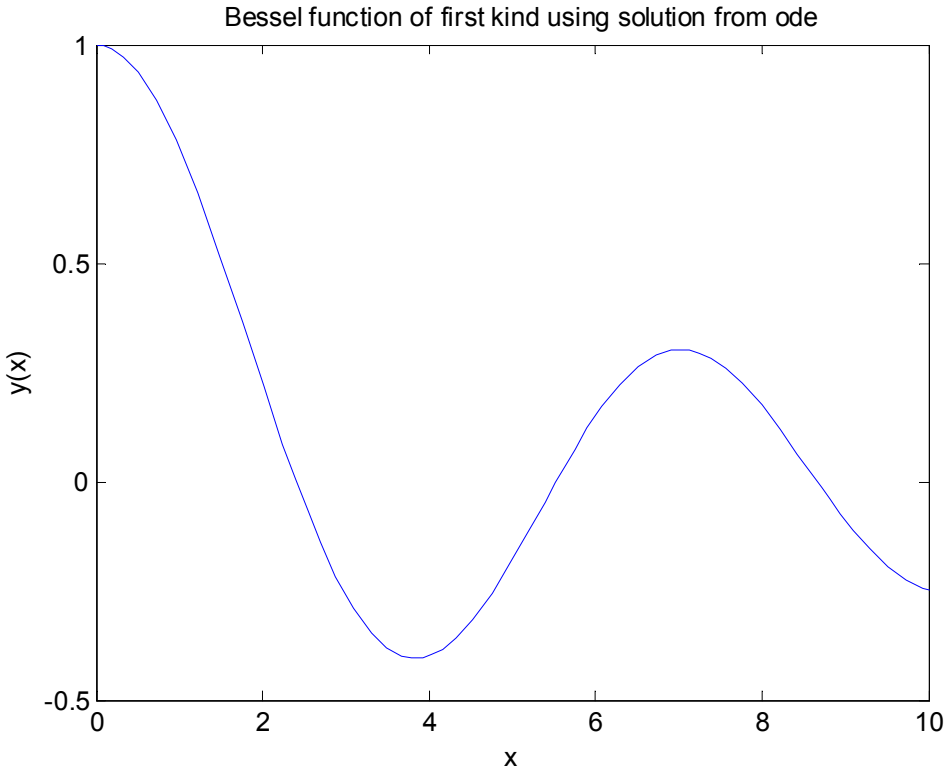
Problem 1:

1) Copy the code in a matlab file called plot_bessel_usinig_ode.m and run it on the command prompt. The sample command line input and the graph obtained are as follows.

```
>> plot_bessel_using_ode(10)
>>
```



2) I have made a matlab file `plot_bessel_using_besselj` which contains the function of the same name. We can run the command on matlab window.

```
>> plot_bessel_using_besselj(10);
>>
```

The output plot obtained is as follows.

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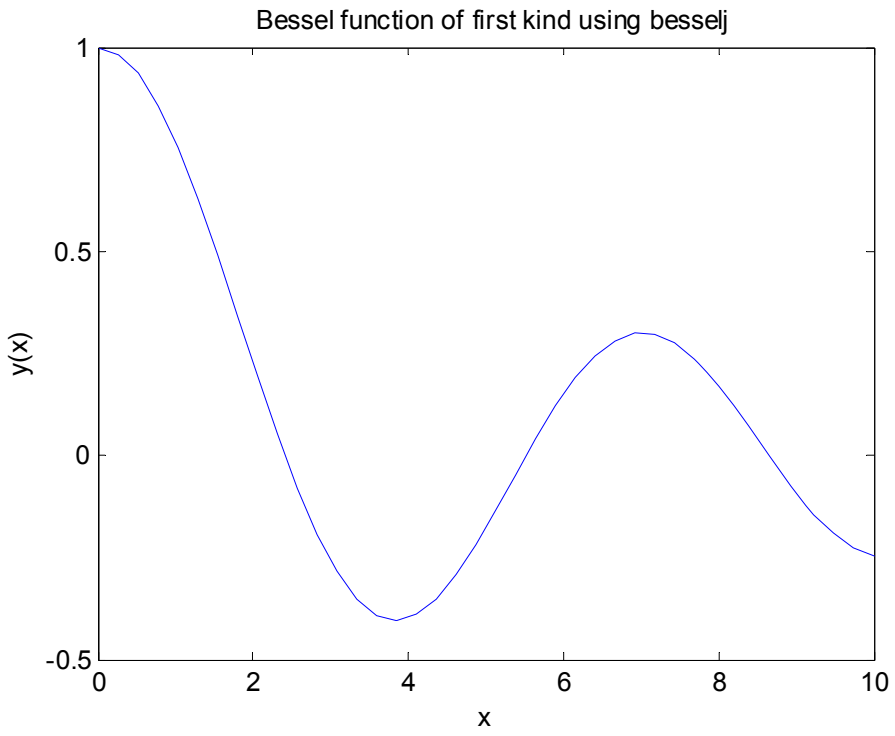

3) The function which uses the truncated infinite series to get the solution is written in matlab file "`plot_bessel_using_my_bessel.m`"
The sample input is given below and the output graphs are also presented.

```
>> plot_bessel_using_my_bessel(10)
>>
```

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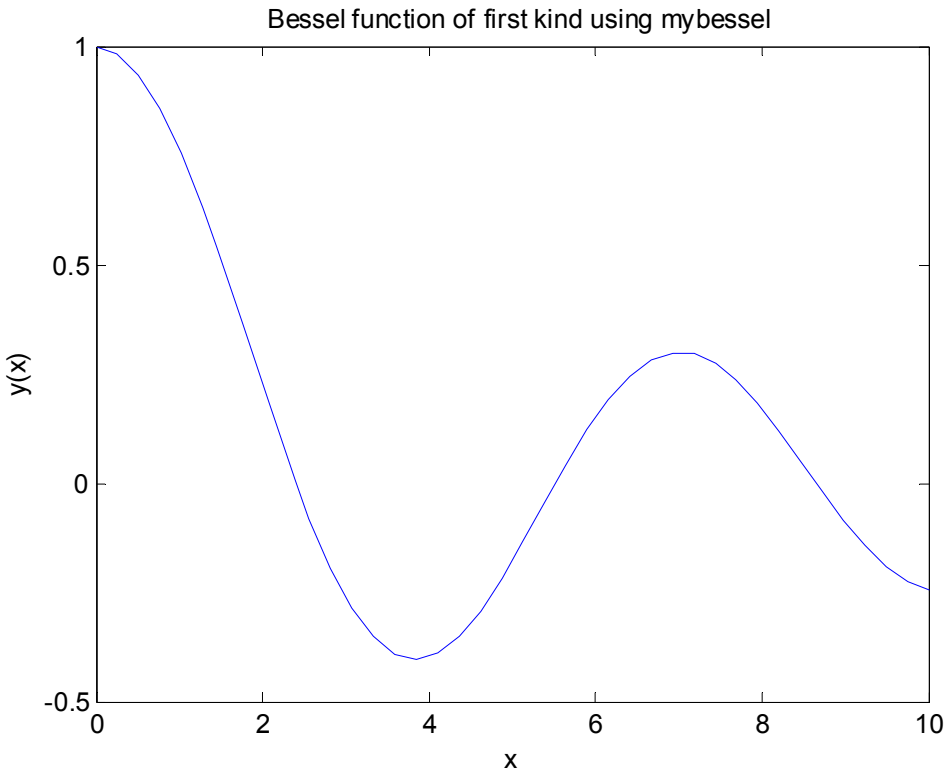

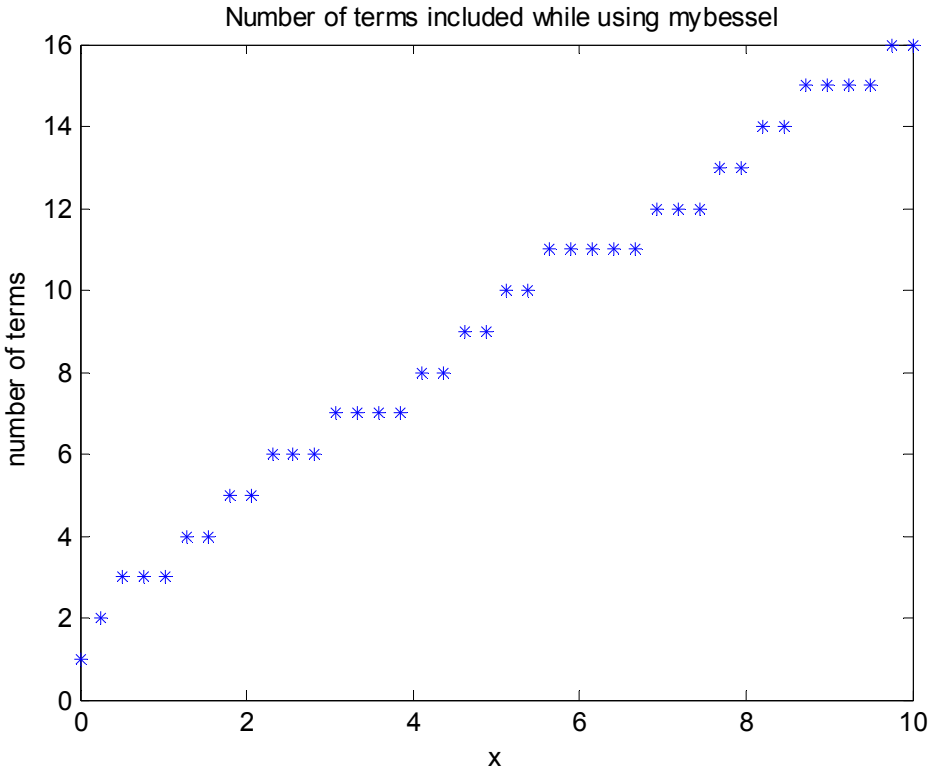

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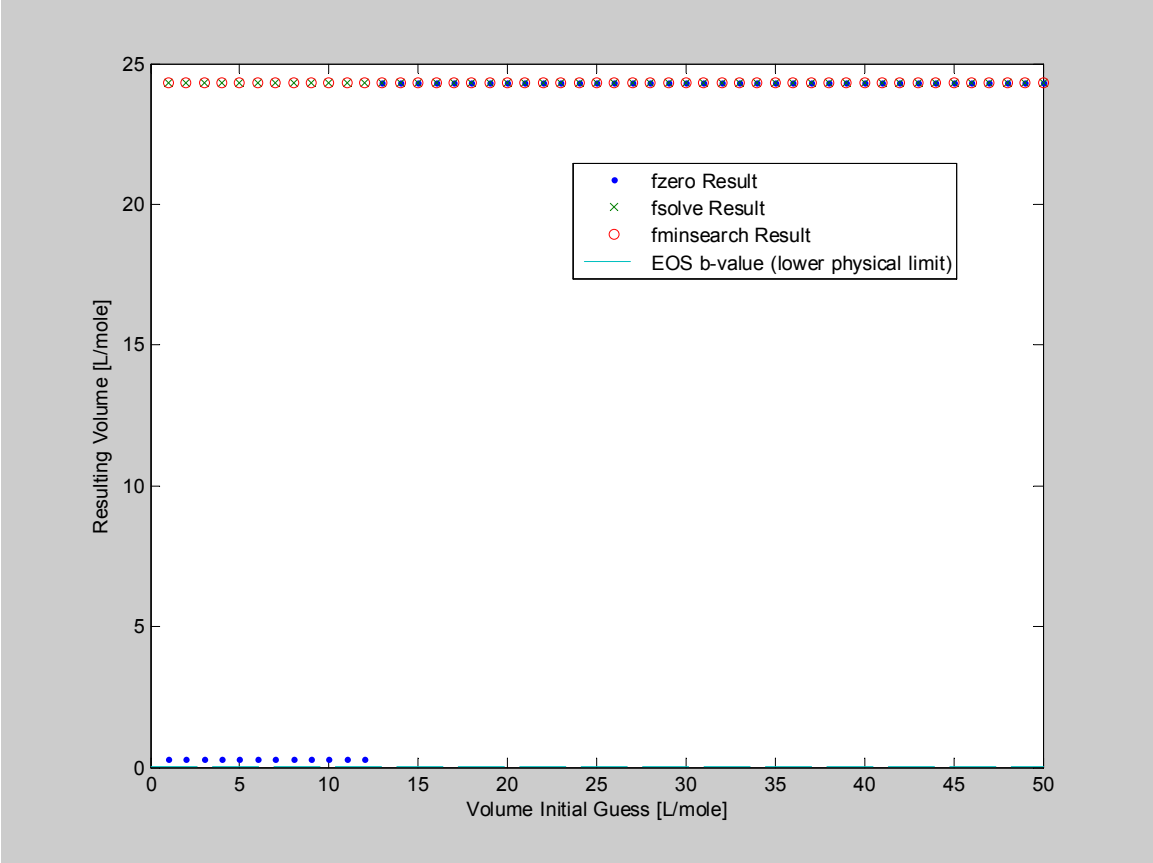
Homework Set #1
Problem #2 Solution

```
Vapor Volume Root (fzero, V_guess=50) (L/mole):  24.3051
Vapor Volume Root (fsolve, V_guess=50) (L/mole):  24.3051
Vapor Volume Root (fminsearch, V_guess=50) (L/mole):  24.3051
```



The plot appears to show that `fzero` does not perform as robustly as `fsolve` and `fminsearch`, which both yield the correct root over the entire range of guesses. In this case we are not concerned with the numerical noise in the solution near the root, as this can be reduced by changing the tolerances of the solver. Adjusting the tolerances may also help `fzero` find the correct root more robustly.

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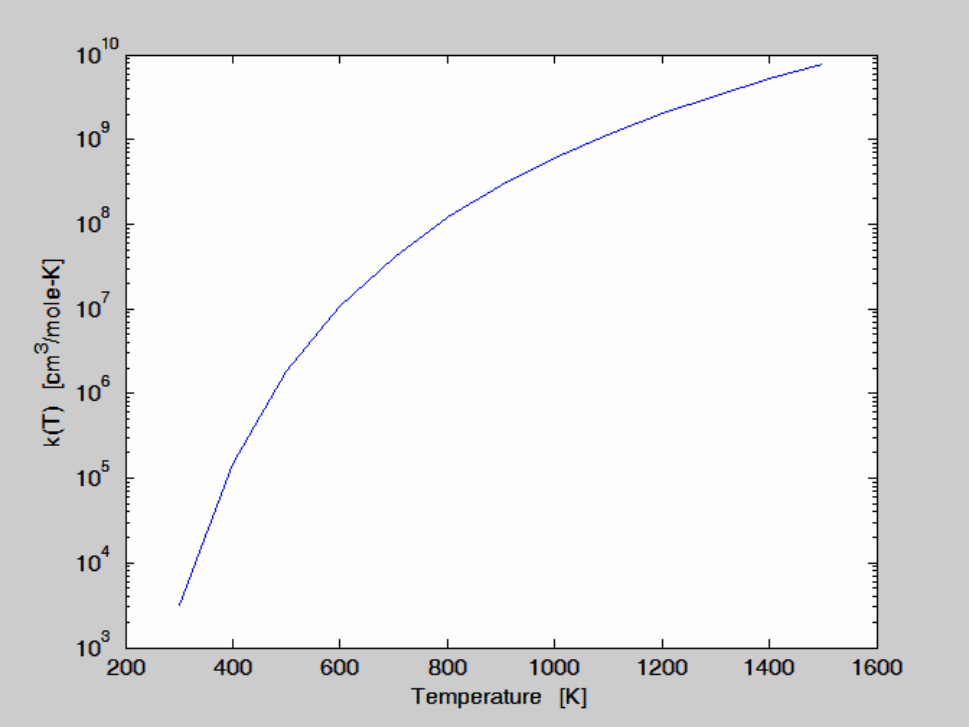
Homework Set #1
Problem #3 Solution

Rate constant plot:



Text file output:

```
Rate constant data for:
NH2OH + HO2 --> NH2O. + HOOH

Temp (K)      k(T) (cm3/mole-s)
300           3.140102e+003
400           1.488662e+005
500           1.793926e+006
600           1.058311e+007
700           4.082521e+007
800           1.195183e+008
900           2.891187e+008
1000          6.090090e+008
1100          1.155976e+009
1200          2.024043e+009
1300          3.323935e+009
1400          5.182339e+009
1500          7.741104e+009
```

Excel file output:

Rate constant data for:
NH2OH + HO2 --> NH2O. + HOOH

Temp (K)	k(T) (cm3/mole-s)
300	3.14E+03
400	1.49E+05
500	1.79E+06
600	1.06E+07
700	4.08E+07
800	1.20E+08
900	2.89E+08
1000	6.09E+08
1100	1.16E+09
1200	2.02E+09
1300	3.32E+09
1400	5.18E+09
1500	7.74E+09

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