Computer Lab 3

- Go to the web to copy the following files into your **ma302** directory:
  - ◇ Library routines in MATLAB:

    ```
    ode45.m
    odeset.m
    odeget.m
    ```

  - ◇ Lecture related Matlab files:

    ```
    double_pendulum.m
    drive_2_pendulum.m
    movie_2_pendulum.m
    ```

  I have made some late modifications. Download again even if you have prepared the files before.

- Use the new rkf45 routine to investigate the dynamic behavior of the double pendulum.
  - ◇ A script for this investigation is already written in the file called **drive_2_pendulum.m**.
  - ◇ Enter a length ℓ and an initial value y_0 for the initial positions and initial velocities of mass A and B.
  - ◇ Study the figures and see if you can make an interpretation of the results.
  - ◇ Let the pendulum run for a long time, say, $t = 400$ in several increments. Study the behavior.
  - ◇ Change the initial values to something else. Redo the experiment. Try to think of some interesting initial conditions, such as $y_0 = [0, 0, 0, 2]$.

- Open another window and load in the file **movie_2_pendulum.m**.
  - ◇ Use the same values of ℓ and y_0 as in your other window. You should see an animation of the double pendulum.
  - ◇ To show you the slow motion, I *pause* the motion step by step. Hit the return key to continue the motion. It is very slow. So perhaps you should integrate only up to $t = 5$ to get some feelings. The code will erase some old frames to show new pictures.
  - ◇ You can go into the movie file and comment out the following two lines to see a continuous motion.

```
disp('Hit return to continue the swing')
pause
```

- Think about how the two experiments interpret each other about the motion of the double pendulum.
- Now begin to work on your second project.