Gauging the Performance

- Why are there different overheads in running the software?
  - ◇ Different software may use different methods. Therefore the cost will be different.
  - ◇ Even different ways of implementing the same method will result in different performance.
  - ◇ Different error tolerance requirements will end up with different cost. Higher accuracy usually requires more computational cost.
  - ◇ Stiff problems are much harder to solve than non-stiff problems.
- In numerical ODE, the overheads can be measured in terms of:
  - ◇ **flops** = the count of floating point operations.
  - ◇ **time** = the CPU time.
  - ◇ **function calls** = the count of calls to the function evaluation.
- When gauging the performance, it is important that all measurements are taken under the same circumstances.
- In MATLAB, the flops can be estimated by

```
flops(0);
(insert the operation here)
flops_count = flops;
```

- In MATLAB, the elapsed time can be measured in seconds by

```
t0 = clock;
(insert the operation here)
time_count = etime(clock,t0);
```

  It can also be done by

```
t0 = cputime;
(insert the operation here)
cpu_count = cputime - t0;
```

- Function calls only give a rough estimate of cost among methods. There are other cost not counted
  - ◇ Each step in **ode45** calls for 6 function evaluations.
  - ◇ Each step in **ode23** calls for 4 function evaluations.
  - ◇ Each step in **ode113** calls for 2 function evaluations.
  - ◇ Each step in **ode15s** calls for many more function evaluations.