

Few basic commands to deal with graphical windows:

1. **gcf** : (to get graphical current figure)
2. **scf** : (to select particular graphical current figure)
3. **figure** : (to get graphical current figure)
4. **clf** : (to clear current figure)

clc : to clear the console screen

clear : to clear the variable history

⇒ **plot the solutions of below mentioned problems and labeled the graph axes, graph titles and do needful formatting.**

problem1: to solve first order differential equation analytically as well as numerically through scilab?

$$\frac{dx}{dt} = -0.1x ; x=100 \text{ at } t = 0 \text{ (Initial Value Problem), solve to determine } x(t) \text{ for } 0 < t < 24.$$

Solution: (i) show that the analytical solution is $x(t) = 100 \exp(-0.1t)$ and plot this for t ranging $0 < t < 24$.

```
t = 0:0.1:24;  
plot(t, 100*exp(-1*0.1*t))
```

Solution: (ii) numerical solution using scilab and plot for t ranging $0 < t < 24$ is

```
func xdot = fun(t,x)  
xdot = -0.1*x;  
end function  
x0 = 100;  
t0 = 0;  
t = 0:0.1:24;  
x=ode(x0,t0,t,fun);  
plot(t, x)
```

(ii) also try numerical solution using scilab by following way and plot for t ranging $0 < t < 24$ is

```
func xdot = fun(t,x)  
xdot = -0.1*x;  
end function  
t = 0:0.1:24;
```

```
x=ode(100,t);  
plot(t, x )
```

problem2: to solve first order differential equation numerically through scilab?

$$\frac{du}{dt} = ku(t)[1 - u(t)] ; u_0 = 1/100 \text{ at } t = 0 \text{ (Initial Value Problem), plot } u(t) \text{ for } 0 < t < 100.$$

Solution: following is the scilab code,

```
func udot = f(t,u)  
udot = k*u*(1-u);  
end function  
u0 = 1/100;  
t0 = 0;  
k = 0.2;  
t = 0:1:100;  
u=ode(u0,t0,t,f);  
plot(t, u )
```

problem3: (i) solve the problem of simple harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems.

$$\frac{d^2x}{dt^2} + \omega^2x = 0, \text{ find out } x, \frac{dx}{dt}, \frac{d^2x}{dt^2} \text{ and plot them using scilab for 3 time periods i.e. } t=3T.$$

(ii) extend the same problem to the damped harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems.

(iii) extend the same problem to the Forced harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems.

Problem4: (i) solve the problem of systems of ODEs i.e combination of two or more LDEs using scilab simultaneously.

Problem5: (i) try Euler's method to solve the problem of 1st order ODEs using scilab .

Problem6: (i) try Runge Kutta's method to solve the problem of 2nd and higher order ODEs using scilab .

try to solve and plot some more different type of differential equations yourself for practice.

All the Best.