Department of Mechanical Engineering
University of Bath

ME40064: System Modelling & Simulation
ME50344: Engineering Systems Simulation

Tutorial 7: Time Integration Schemes

Example Solutions

1. Sample code for integrating the equation using the forward Euler method:

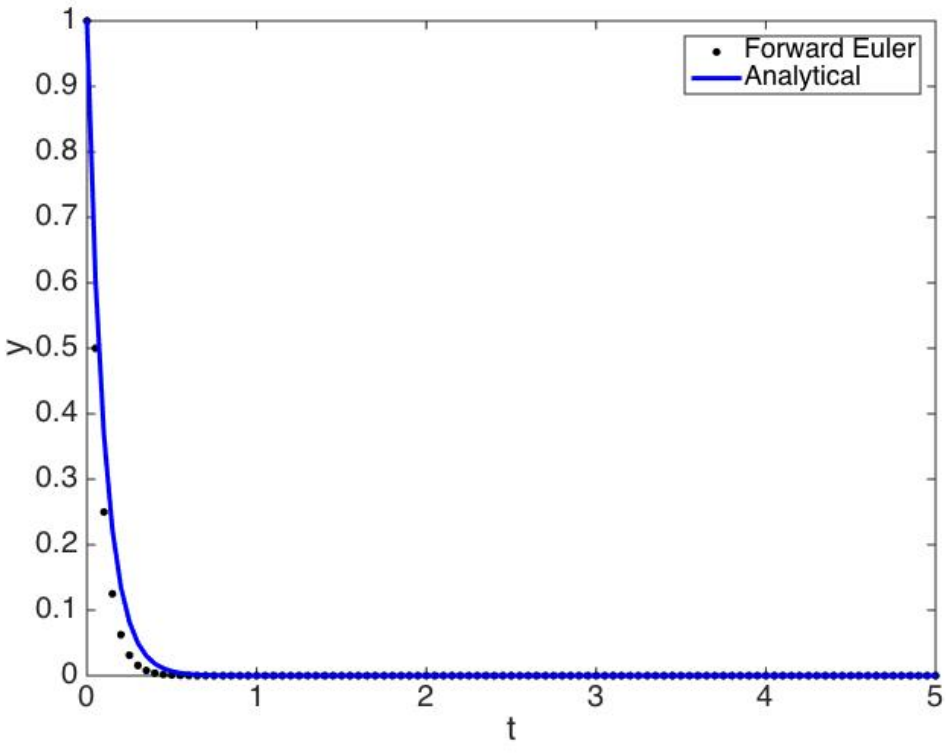
```
T = 5;
dt = 0.05;
Nsteps = T/dt;
y=zeros(Nsteps+1,1);
y(1) = 1;
t=zeros(Nsteps+1,1);

for i = 1:Nsteps

    y(i+1) = y(i)-10*dt*y(i);
    t(i+1) = t(i) + dt;
end

plot(t,y,'.k',t,exp(-10*t),'b');
```

Sample plot for this scheme for dt = 0.05:



2. Sample code for integrating the equation using the backward Euler method:

```
T = 5;
dt = 0.05;
Nsteps = T/dt;
y=zeros(Nsteps+1,1);
y(1) = 1;
t=zeros(Nsteps+1,1);

for i = 1:Nsteps

    y(i+1) = y(i)/(1+10*dt);
    t(i+1) = t(i) + dt;
end

plot(t,y,'.k',t,exp(-10*t),'b');
```

Sample plot for this scheme for dt = 0.05: