## Euler's Method for System of ODE's

Original IVP:

$$m\frac{d^2x}{dt^2}+c\frac{dx}{dt}+kx=0,\quad 0<t<15\text{ s},$$
$$x(0)=1\text{ m},$$
$$\dot{x}(0)=0,$$
$$m=20\text{ kg},\ c=5\text{ N}\cdot\text{s/m},\ k=20\text{ N/m}.$$

System of ODE's:

$$\frac{dx}{dt}=v=f_1,$$
$$\frac{dv}{dt}=-\frac{c}{m}v-\frac{k}{m}x=f_2,$$
$$x(0)=1\text{ m},\ v(0)=0.$$

Numerical solution is developed by applying Euler's method. Accuracy can be improved by increasing the number of intervals. 128 intervals results in a better result especially for the velocity function.

$x(t)$ versus time

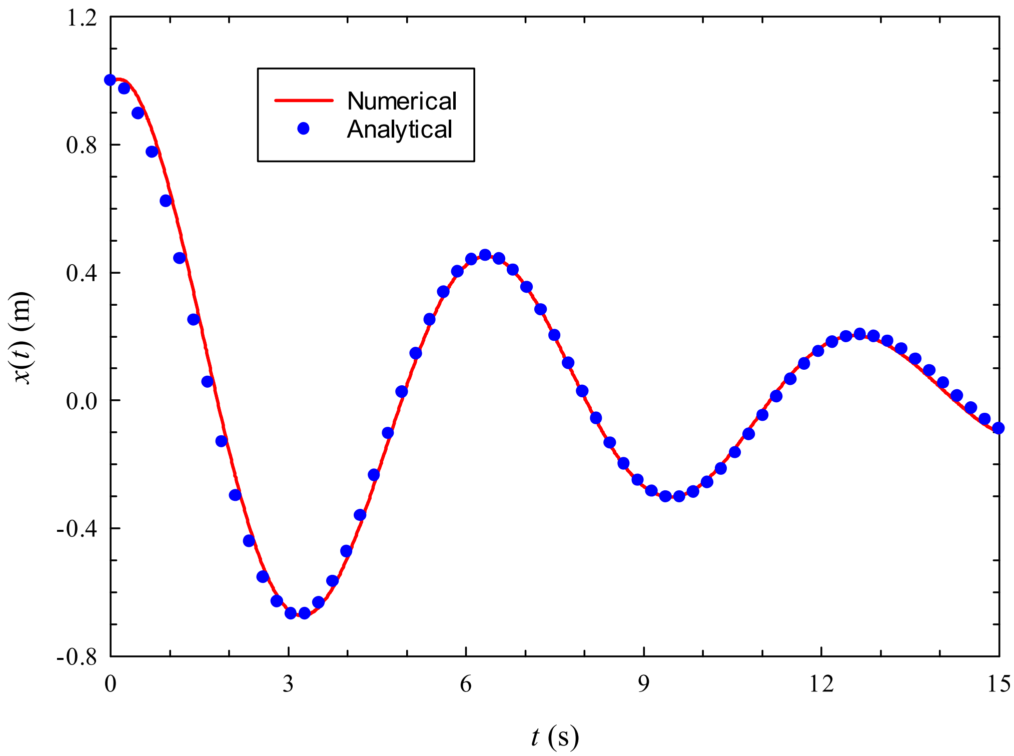


**Fig. 1:** Analytical and numerical solutions for position. Number of intervals = 64.

$v(t)$ versus time

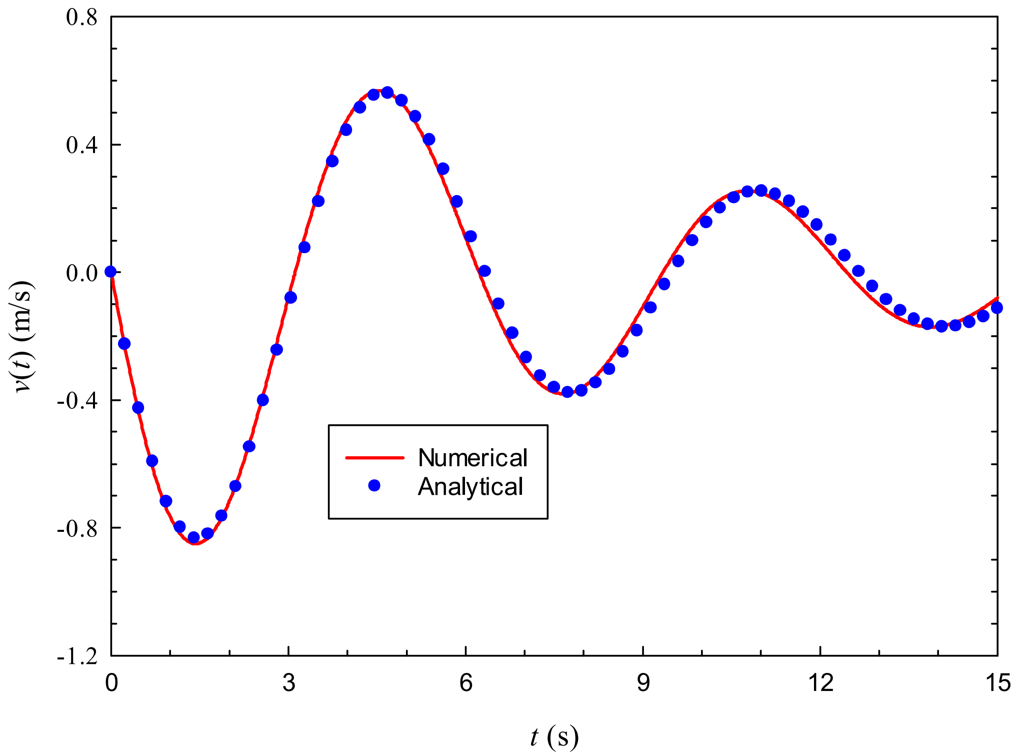


**Fig. 2:** Analytical and numerical solutions for velocity. Number of intervals = 64.