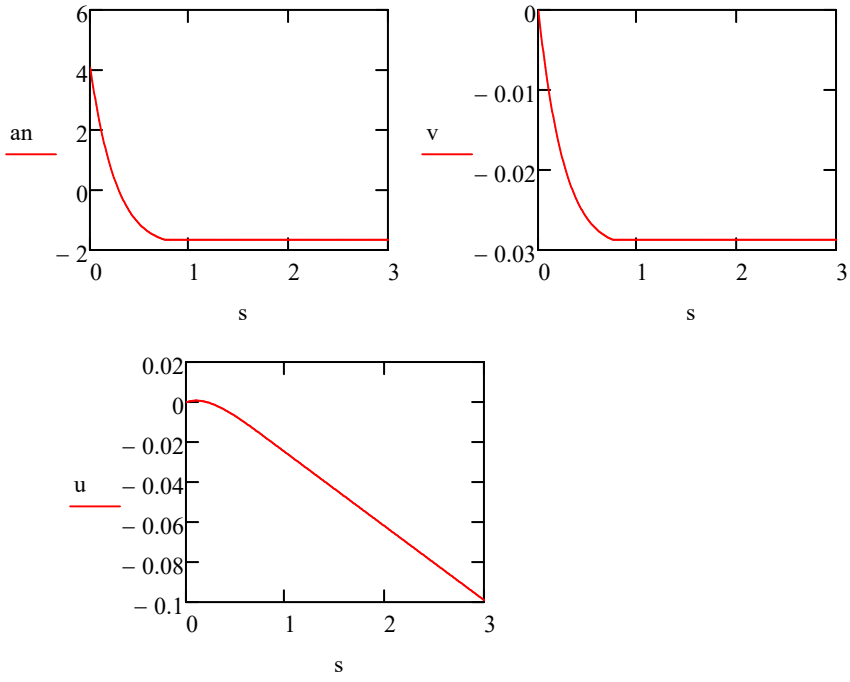
```
for m=1:n1
    p(m)=0.0;
end;
jk1=jk+1;
for n=1:jk1;
t=(n-1)*dt;
p(n)=450000*(1-t/td)*exp(-2.0*t/td);
end;
an(1)=(p(1)-c*v(1)-k*u(1))/ma;
kh=k+3.0*c/(theta*dt)+6.0*ma/(theta*dt)^2;
a=6.0*ma/(theta*dt)+3.0*c;
b=3.0*ma+theta*dt*c/2.0;
for i=1:n1;
s(i)=(i-1)*dt;
end;
for i=2:n1;
ww=(p(i)-p(i-1))*theta+a*v(i-1)+b*an(i-1);
xx=ww/kh;
zz=(6.0*xx/((theta*dt)^2)-6.0*v(i-1)/(theta*dt)-3.0*an(i-1))/theta;
yy=dt*an(i-1)+dt*zz/2.0;
v(i)=v(i-1)+yy;
an(i)=an(i-1)+zz;
vv=dt*v(i-1)+dt*dt*(3.0*an(i-1)+zz)/6.0;
u(i)=u(i-1)+vv;
end;
figure(1);
    plot(s,u);
    xlabel(' time (t) in seconds')
    ylabel(' Response displacement u in m')
    title(' dynamic response')
```

$$\begin{pmatrix} p \\ u \end{pmatrix}$$

$$\begin{pmatrix} v \\ an \\ s \end{pmatrix} := \text{SolveProblem}(dt)$$



Input independent variables to define the problem

$ma := 110000$

$k := 10075582$

$\theta := 1.42$

$r := 0.07$

$tt := 3.0$

$n := 300$

$td := 0.75$

$u_n := 0$

$v_n := 0$

$a_n := 0$

Thesse could be set here or in the program to all zeroes to commence

Calculate variables

$c := 2 \cdot r \cdot \sqrt{k \cdot ma}$

$n1 := n + 1$

$dt := \frac{tt}{n}$

$$jk := \frac{td}{dt} \qquad jk = 75$$

$$jk1 := jk + 1$$

Do the iteration

SolveProblem(dt) :=

$p_n \leftarrow 0$

$an_n \leftarrow 0$

$u_n \leftarrow 0$

$v_n \leftarrow 0$

for $i \in 0..jk$

  $t \leftarrow i \cdot dt$

  $p_i \leftarrow 450000 \cdot \left(1 - \frac{t}{td}\right) \cdot e^{-2 \cdot \frac{t}{td}}$

$an_0 \leftarrow \frac{\left(p_0 - c \cdot v_0 - k \cdot u_0\right)}{ma}$

$kh \leftarrow k + \frac{3.0 \cdot c}{\theta \cdot dt} + \frac{6.0 \cdot ma}{(\theta \cdot dt)^2}$

$a \leftarrow \frac{6.0 \cdot ma}{\theta \cdot dt} + 3.0 \cdot c$

$b \leftarrow 3.0 \cdot ma + \frac{\theta \cdot dt \cdot c}{2.0}$

for $i \in 0..n$

  $s_i \leftarrow i \cdot dt$

for $i \in 1..n$

  $ww \leftarrow \left(p_i - p_{i-1}\right) \cdot \theta + a \cdot v_i + \frac{b \cdot an_i}{\theta}$

  $xx \leftarrow \frac{ww}{kh}$

  $zz \leftarrow \left[\frac{6.0 \cdot xx}{(\theta \cdot dt)^2}\right] - \frac{6.0 \cdot v_i}{\theta \cdot dt} - \frac{3.0 \cdot an_i}{\theta}$

  $yy \leftarrow dt \cdot an_i + \frac{dt \cdot zz}{2.0}$

  $v_i \leftarrow v_{i-1} + yy$

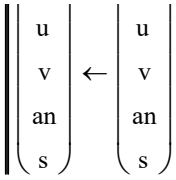
  $an_i \leftarrow an_{i-1} + zz$

  $vv \leftarrow dt \cdot v_i + \frac{dt \cdot dt \cdot \left(3.0 \cdot an_i + zz\right)}{6.0}$

  $u_i \leftarrow u_{i-1} + vv$

$\begin{pmatrix} p \end{pmatrix} \quad \begin{pmatrix} p \end{pmatrix}$

i-1))/theta;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