
Oscillateur conservatif lineaire a un degre de liberte

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Question1

```
%1.1
w0 = 2*pi;
q = dsolve('D2q+(2*pi)^2*q=0','q(0)=1','Dq(0)=0');

%1.2
E = 0.5*((diff(q))^2+(2*pi*q)^2);
E = simplify(E)

##: Support of character vectors and strings will be removed in a
future
release. Use sym objects to define differential equations instead.

E =

2*pi^2
```

Question2 EULER implicite

```
% 2.1 on peut trouver que  $D^2q = -w_0^2 q$ . Donc, si l'on simplifier
l'equation
%5, on obtient les equations 6

%2.2
%methode 1
q2 = [1];
dq2 = [0];
deltat=0.01;
for i=1:300
    q2=[q2,q2(i)+deltat*dq2(i)];
    dq2=[dq2,dq2(i)+deltat*(-w0^2*q2(i))];
end

%2.3
```

```

figure(1);
fplot(q,[0,3]);
hold on;
plot([0:0.01:3],q2);
hold off;

%2.4
E2 = 0.5.*((dq2).^2+(2*pi.*q2).^2);
figure(2);
fplot(E);
hold on;
plot([0:0.01:3],E2);
hold off;
%plus le deltat est petit, plus le resultat est proche avec la
  solution
%exacte

%2.5
syms deltat1;
Ma_Amplifica=[1,deltat1;-w0^2*deltat1,1];
[x,y]=eig(Ma_Amplifica)

x =

[ (70368744177664*((2778046668940015^(1/2)*deltat1*i)/8388608
- 1))/(2778046668940015*deltat1) + 70368744177664/
(2778046668940015*deltat1), 70368744177664/(2778046668940015*deltat1)
- (70368744177664*((2778046668940015^(1/2)*deltat1*i)/8388608 + 1))/
(2778046668940015*deltat1)]

[

1,

1]

y =

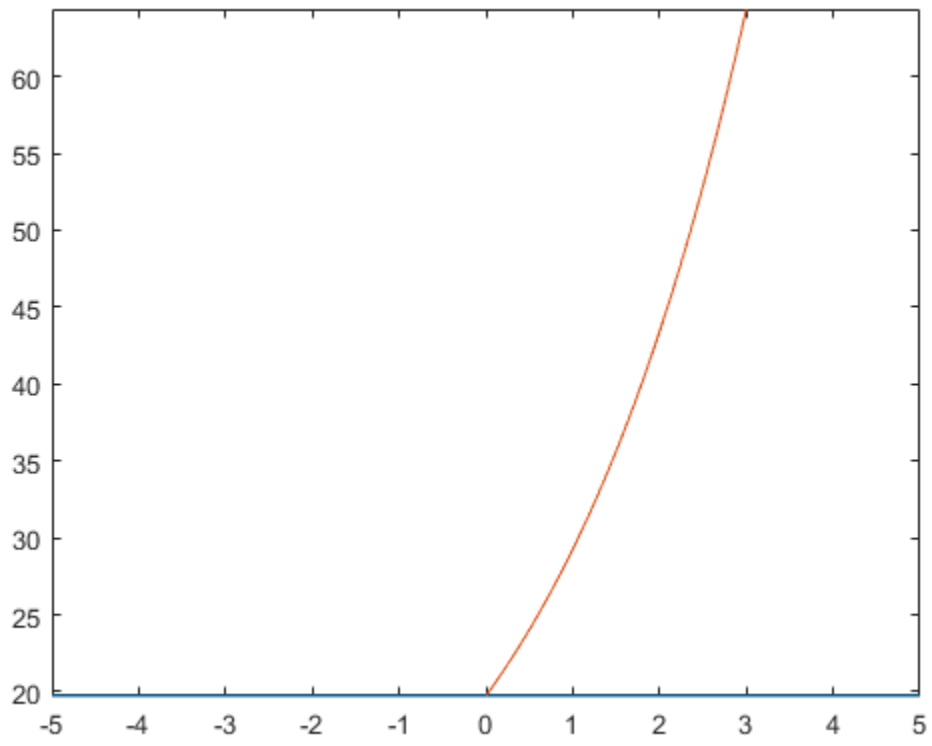
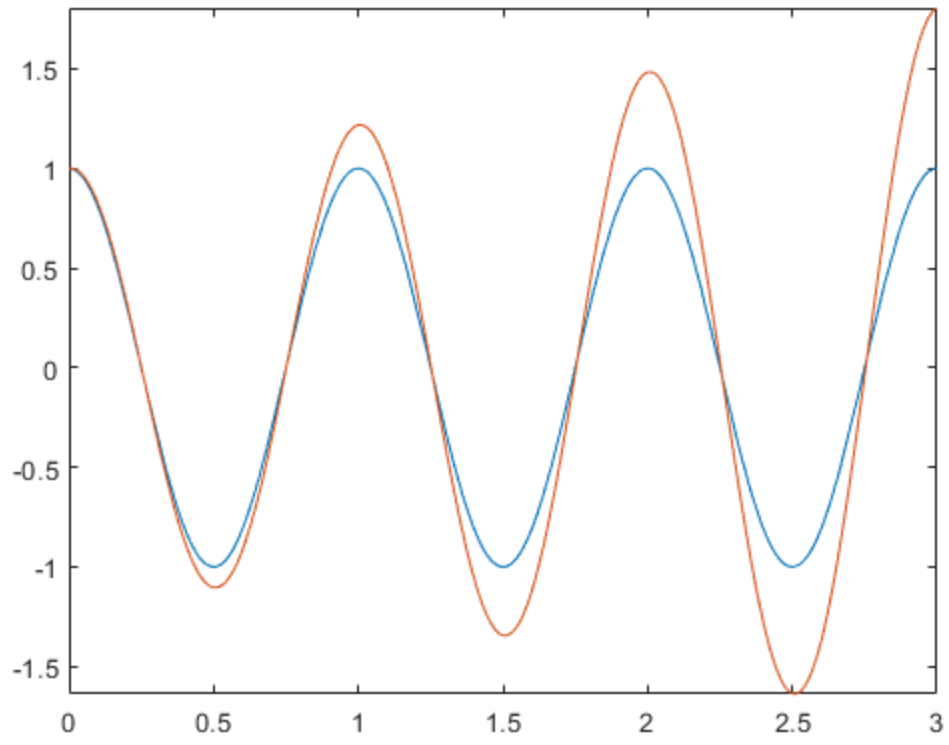
[ 1 - (2778046668940015^(1/2)*deltat1*i)/8388608,
0]

[

0,
(2778046668940015^(1/2)*deltat1*i)/8388608 + 1]

```

Oscillateur conservatif linéaire à un degré de liberté



question3 EULER explicite

```
%3.1
q3 = [1];
dq3 = [0];
deltat=0.01;
for i=1:300
    q3=[q3,(q3(i)+deltat*dq3(i))/(1+deltat^2*w0^2)];
    dq3=[dq3,dq3(i)+deltat*(-w0^2*q3(i+1))];
end

%3.2
figure(3);
fplot(q,[0,3])
hold on;
plot([0:0.01:3],q3)
hold off;

%3.3 on change deltat

%3.4
E3 = 0.5.*((dq3).^2+(2*pi.*q3).^2);
figure(4);
fplot(E);
hold on;
plot([0:0.01:3],E3);
hold off;
%plus le deltat est petit, plus le resultat est loin avec la solution
%exacte

% 3.5
syms deltat2;
Ma_Amplifica2=inv([1,-deltat2;w0^2*deltat2,1]);
[x,y]=eig(Ma_Amplifica2)

x =

[ 70368744177664/(2778046668940015*deltat2)
 + (8388608*(2778046668940015*deltat2^2 +
 70368744177664)*(2778046668940015^(1/2)*deltat2 - 8388608i))/
(2778046668940015*deltat2*(deltat2^2*2778046668940015i +
 70368744177664i)), 70368744177664/(2778046668940015*deltat2)
 - (8388608*(2778046668940015*deltat2^2 +
 70368744177664)*(2778046668940015^(1/2)*deltat2 + 8388608i))/
(2778046668940015*deltat2*(deltat2^2*2778046668940015i +
 70368744177664i))]

[
    1,
```

1]

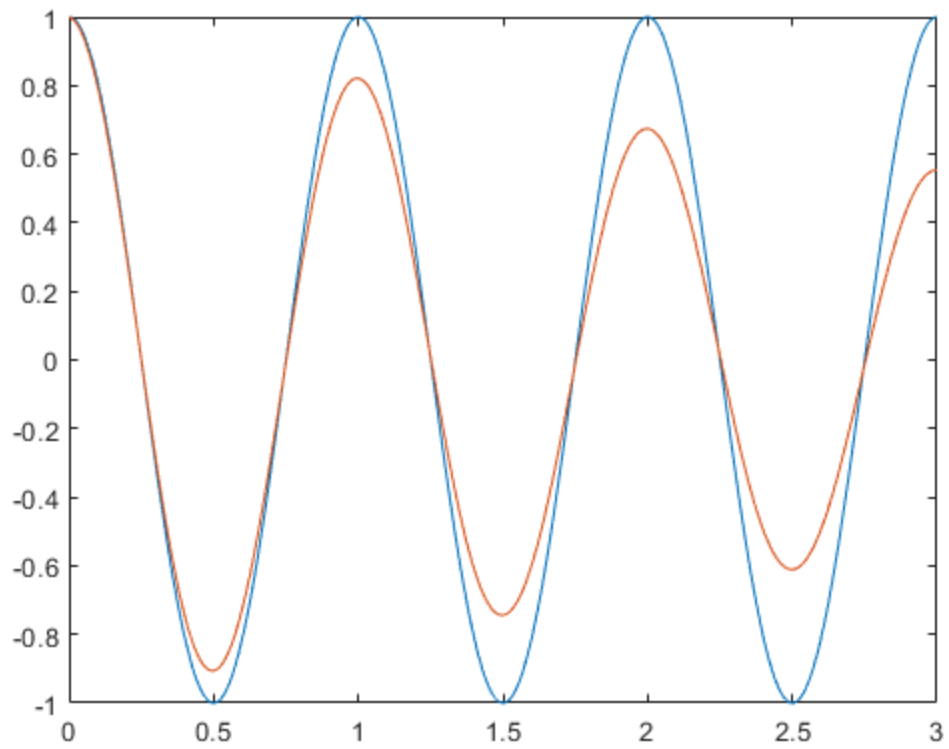
y =

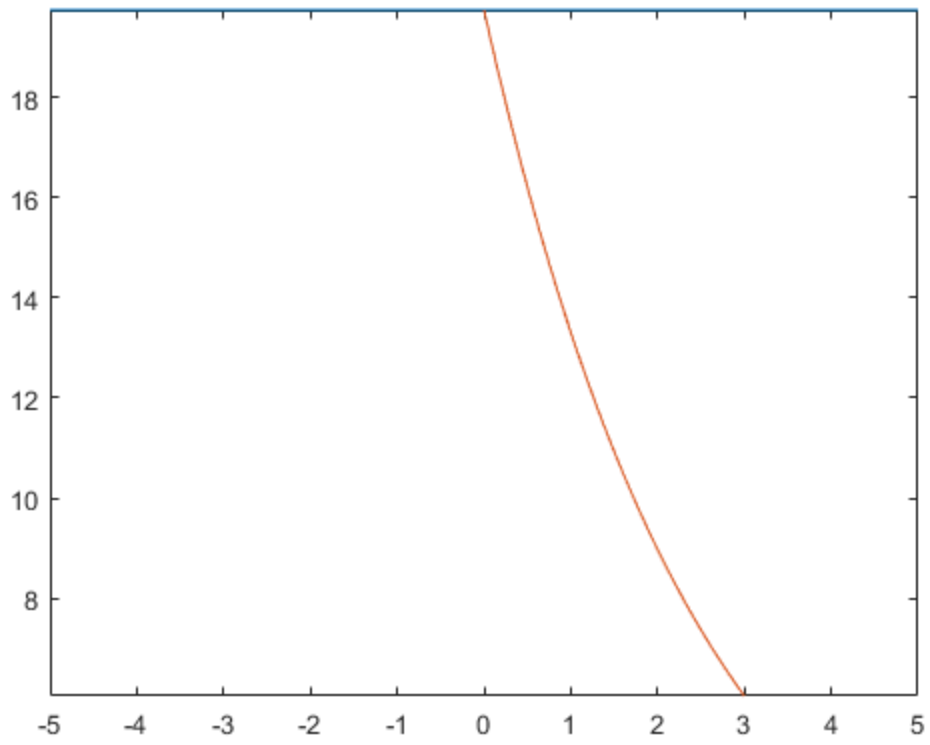
$$\frac{-(8388608 \cdot (2778046668940015)^{1/2} \cdot \text{deltat2} - 8388608i)}{(\text{deltat2}^2 \cdot 2778046668940015i + 70368744177664i),}$$

0]

[

$$\frac{(8388608 \cdot (2778046668940015)^{1/2} \cdot \text{deltat2} + 8388608i)}{(\text{deltat2}^2 \cdot 2778046668940015i + 70368744177664i)]$$





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