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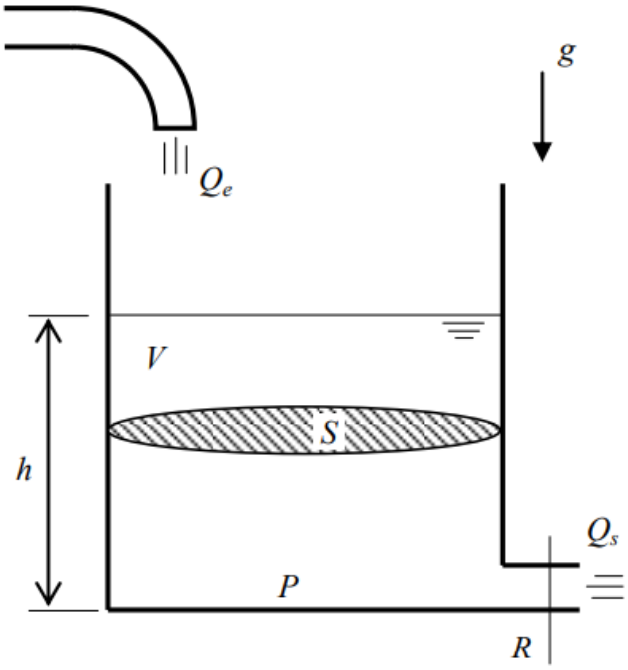
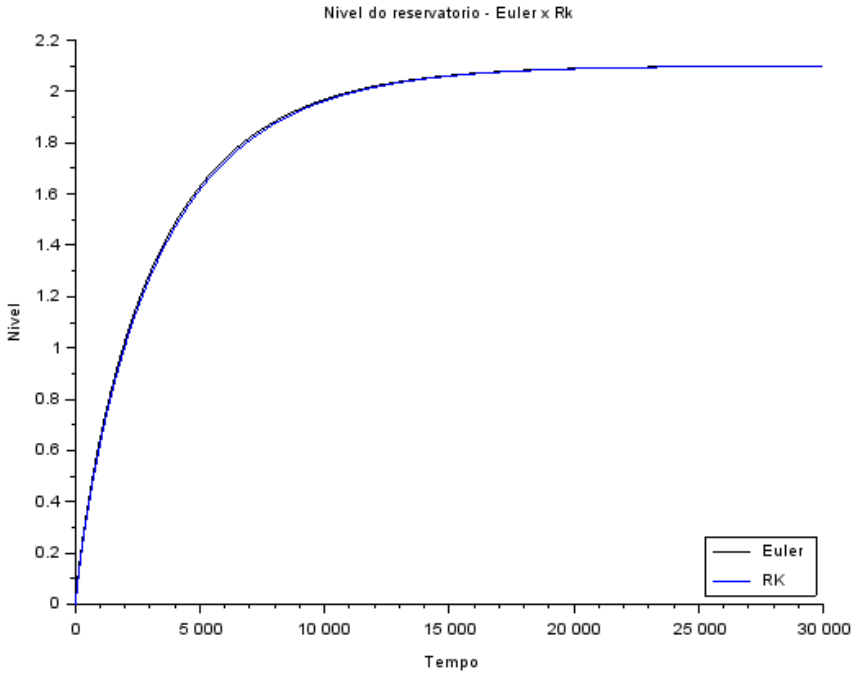
Lista 1 - PME3380 Modelagem de Sistemas Dinâmicos

Exercício 1:



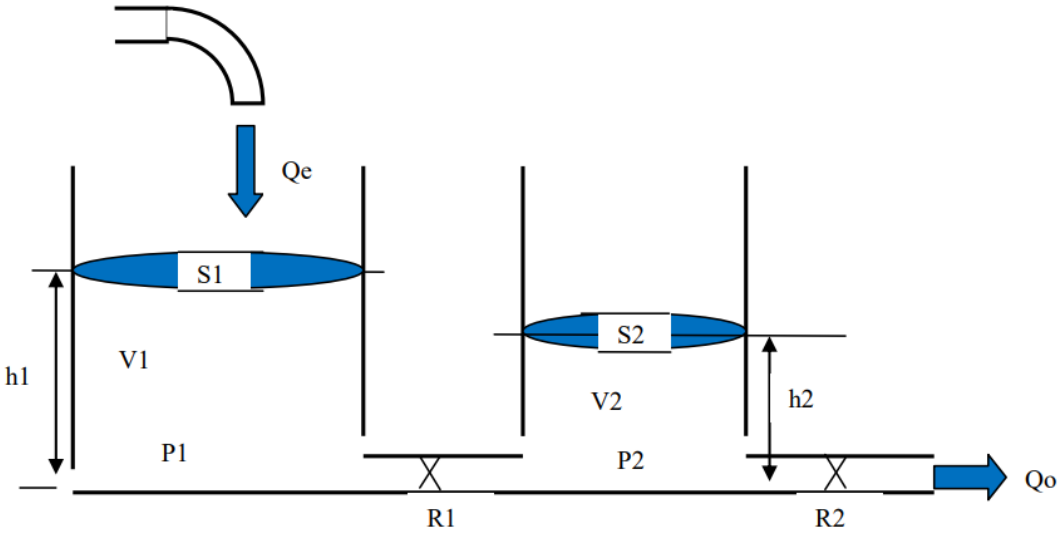


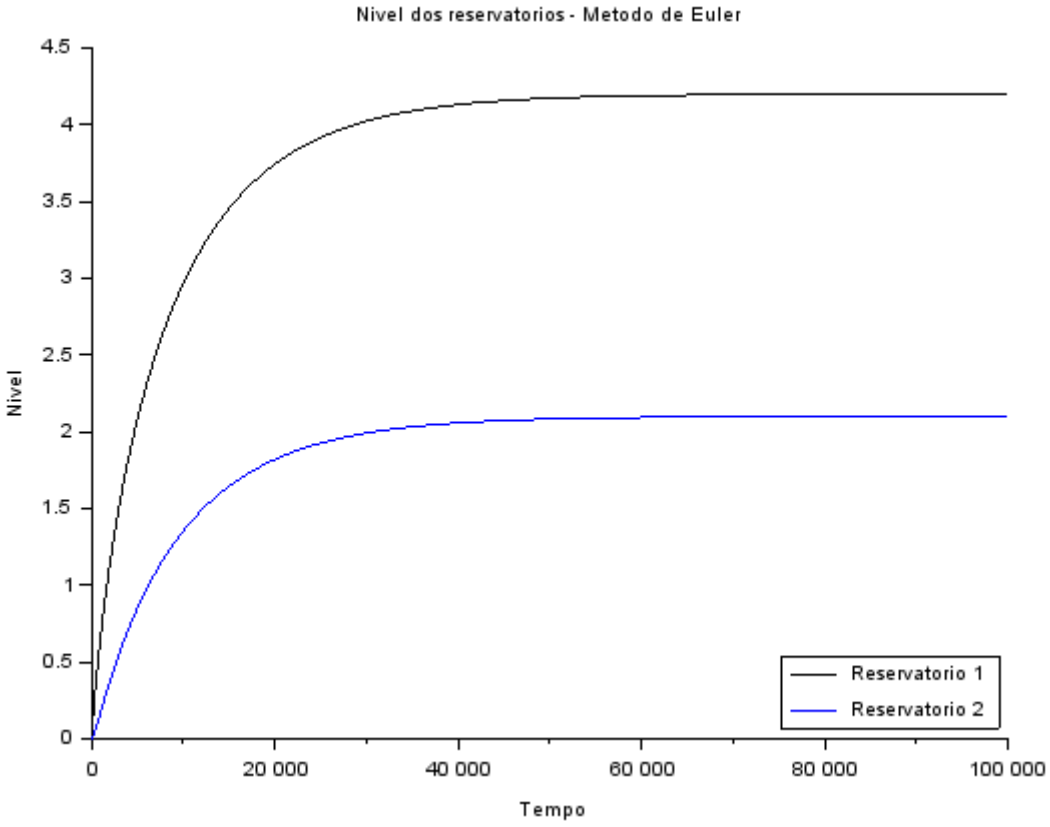
Código 1:

```
clear
function [q]=func_volume(he, hs, R)
   q=sqrt(ro*g*abs(he-hs)/R);
endfunction

t(1)=0;
```

```
tf=30000;
heu(1)=0;
hrk(1)=0;
passo=100;

S=10;
R=2*10^8;
ro=1000;
g=10;

qe=0.010247;

n=round(tf/passo);
   for i=1:n
   //Euler
   t(i+1)=t(i)+passo;
   qs=func_volume(0,heu(i),R);
   heu(i+1)=heu(i)+passo*(qe-qs)/S;
   //RK
   k1=passo*(qe-sqrt(ro*g*hrk(i)/R))/S;
   k2=passo*(qe-sqrt(ro*g*(hrk(i)+k1/2)/R))/S;
   k3=passo*(qe-sqrt(ro*g*(hrk(i)+k2/2)/R))/S;
   k4=passo*(qe-sqrt(ro*g*(hrk(i)+k3)/R))/S;
   hrk(i+1)=hrk(i)+((k1+2*k2+2*k3+k4)/6);
   end

plot2d([t,t],[heu,hrk],[1,2]);
legends(["Euler","RK"],[1,2],4);
xtitle("Nivel do reservatorio - Euler x Rk","Tempo","Nivel");
```

Exercício 2:

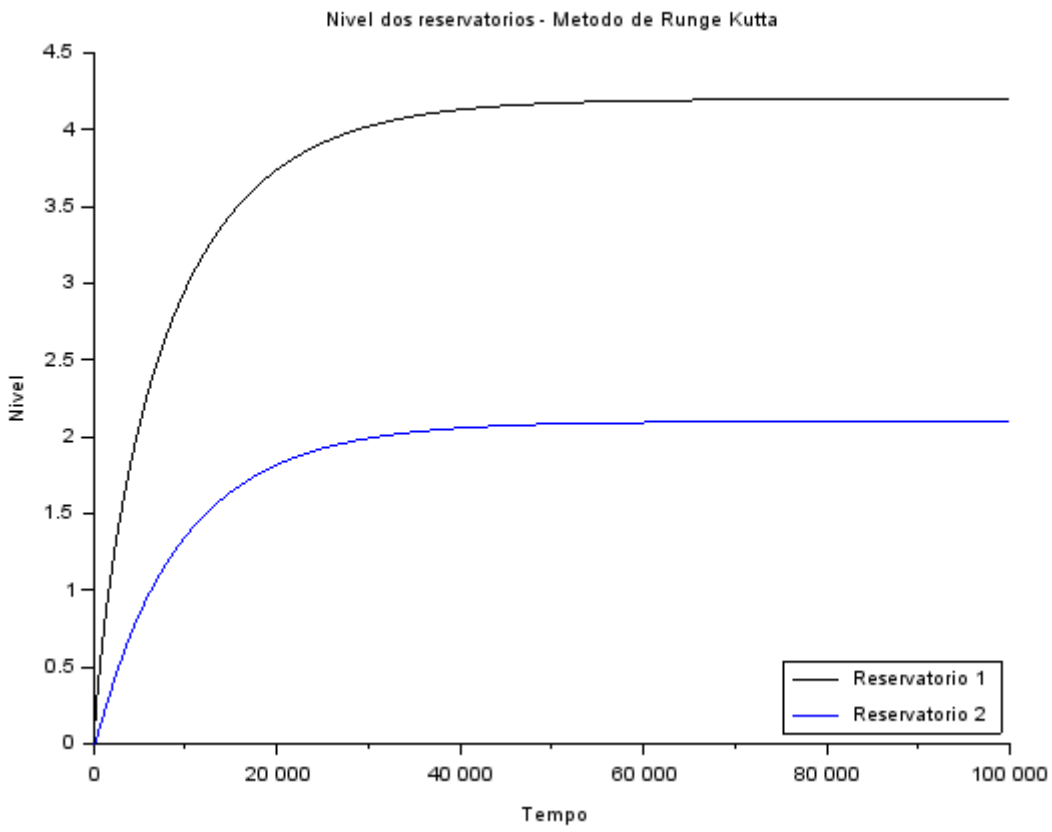




Código 2 (Euler):

```
clear
function [q]=func_volume(he, hs, R)
  q=sqrt(ro*g*abs(he-hs)/R);
endfunction

t(1)=0;
tf=100000;
```

```
h1(1)=0;
h2(1)=0;
passo=100;

S1=10;
R1=2*10^8;
S2=10;
R2=2*10^8;
ro=1000;
g=10;

qe=0.010247;

n=round(tf/passo);
   for i=1:n
   t(i+1)=t(i)+passo;

   qm=func volume(h1(i),h2(i),R1);
   qs=func volume(h2(i),0,R2);

   h1(i+1)=h1(i)+passo*(qe-qm)/S1;
   h2(i+1)=h2(i)+passo*(qm-qs)/S2;
   end

plot2d([t,t],[h1,h2],[1,2]);
legends(["Reservatorio 1","Reservatorio 2"],[1,2],4);
xtitle("Nivel dos reservatorios - Metodo de Euler","Tempo","Nivel");
```



Código 2 (Runge Kutta):

```
clear
function [q]=func_volume(he, hs, R)
   q=sqrt(ro*g*abs(he-hs)/R);
endfunction

t(1)=0;
tf=100000;
h1(1)=0;
h2(1)=0;
passo=100;

S1=10;
R1=2*10^8;
S2=10;
R2=2*10^8;
ro=1000;
g=10;

qe=0.010247;

n=round((tf-t(1))/passo);
   for i=1:n
   t(i+1)=t(i)+passo;
```

```
   k11=passo*(qe-func_volume(h1(i),h2(i),R1))/S1;
   k12=passo*(qe-func_volume(h1(i)+k11/2,h2(i)+k11/2,R1))/S1;
   k13=passo*(qe-func_volume(h1(i)+k12/2,h2(i)+k12/2,R1))/S1;
   k14=passo*(qe-func_volume(h1(i)+k13,h2(i)+k13,R1))/S1;
   h1(i+1)=h1(i)+((k11+2*k12+2*k13+k14)/6);
   k21=passo*(func_volume(h1(i),h2(i),R1)-func_volume(h2(i),0,R2))/S2;
   k22=passo*(func_volume(h1(i)+k21/2,h2(i)+k21/2,R1)-
func_volume(h2(i)+k21/2,0,R2))/S2;
   k23=passo*(func_volume(h1(i)+k22/2,h2(i)+k22/2,R1)-
func_volume(h2(i)+k22/2,0,R2))/S2;
   k24=passo*(func_volume(h1(i)+k23,h2(i)+k23,R1)-
func_volume(h2(i)+k23,0,R2))/S2;
   h2(i+1)=h2(i)+((k21+2*k22+2*k23+k24)/6);
   end

plot2d([t,t],[h1,h2],[1,2]);
legends(["Reservatorio 1","Reservatorio 2"],[1,2],4);
xtitle("Nivel dos reservatorios - Metodo de Runge Kutta","Tempo","Nivel");
```