```
lam0=1;
T=2;

N=1e5;
sig=1;

% MONTE CARLO

dt=T*1e-4;
S=T/dt;
mumc=zeros(1,S+1);
CCmc=zeros(1,S+1);
tmc=0:dt:T;

tic

x0=tanh(lam0)+lam0/2;
sq=x0*x0/2;
H=(sq-1)*sq-lam0*x0;

for i=1:N

y0=x0+sig*randn;
sq=y0*y0/2;
Hnew=(sq-1)*sq-lam0*y0;
U=rand;
if U<=exp(H-Hnew)
  x0=y0;
  H=Hnew;
end

mumc(1)=mumc(1)+x0;
CCmc(1)=CCmc(1)+x0^2;

x=x0;

for j=1:S

x = x+(x-x^3)*dt+sqrt(2*dt)*randn;
mumc(j+1)=mumc(j+1)+x;
CCmc(j+1)=CCmc(j+1)+x0*x;

end

end

toc

mumc=mumc/N;
CCmc=CCmc/N;
CCmc=CCmc-mumc*mumc(1);

% CLOSURE MC

dt=T*5e-3;
```

```
S=T/dt;
tcl=0:dt:T;
lamcl=zeros(1,S+1);
mucl=zeros(1,S+1);
CCcl=zeros(1,S+1);

tic

lam=lam0;
x=tanh(lam)+lam/2;

sq=x*x/2;
H=(sq-1)*sq-lam*x;
%M1=0;M2=0;M3=0;M4=0;
MM1=0;MM2=0;MM3=0;MM4=0;
for i=1:N
y=x+sig*randn;
sq=y*y/2;
Hnew=(sq-1)*sq-lam*y;
U=rand;
if U<=exp(H-Hnew)
  x=y;
  H=Hnew;
end
%M1=M1+x;M2=M2+x^2;M3=M3+x^3;M4=M4+x^4;
z=x-1;
MM1=MM1+z;MM2=MM2+z^2;MM3=MM3+z^3;MM4=MM4+z^4;
end
%M1=M1/N;M2=M2/N;M3=M3/N;M4=M4/N;
MM1=MM1/N;MM2=MM2/N;MM3=MM3/N;MM4=MM4/N;

lamcl(1)=lam;
%mucl(j+1)=M1;
mucl(1)=MM1+1;

%VV=M1-M3;
%VVCC=M2-M4;
%C2=M2-M1^2;
VV=-(2*MM1+3*MM2+MM3);
VVCC=-(2*MM1+5*MM2+4*MM3+MM4);
VVCC=VVCC-VV*(MM1+1);
C2=MM2-MM1^2;
WW=VV/C2;
VVCC=VVCC/C2;

CCC=C2;
CCcl(1)=C2;

lam=lam+WW*dt;
CCC=(1+VVCC*dt)*CCC;
%x=M1+VV*dt;
x=MM1+1+VV*dt;

for j=1:S

sq=x*x/2;
```

```
H=(sq-1)*sq-lam*x;
%M1=0;M2=0;M3=0;M4=0;
MM1=0;MM2=0;MM3=0;MM4=0;
for i=1:N
y=x+sig*randn;
sq=y*y/2;
Hnew=(sq-1)*sq-lam*y;
U=rand;
if U<=exp(H-Hnew)
  x=y;
  H=Hnew;
end
%M1=M1+x;M2=M2+x^2;M3=M3+x^3;M4=M4+x^4;
z=x-1;
MM1=MM1+z;MM2=MM2+z^2;MM3=MM3+z^3;MM4=MM4+z^4;
end
%M1=M1/N;M2=M2/N;M3=M3/N;M4=M4/N;
MM1=MM1/N;MM2=MM2/N;MM3=MM3/N;MM4=MM4/N;

lamcl(j+1)=lam;
CCcl(j+1)=CCC;
%mucl(j+1)=M1;
mucl(j+1)=MM1+1;

%VV=M1-M3;
%VVCC=M2-M4;
%C2=M2-M1^2;
VV=-(2*MM1+3*MM2+MM3);
VVCC=-(2*MM1+5*MM2+4*MM3+MM4);
VVCC=VVCC-VV*(MM1+1);
C2=MM2-MM1^2;
WW=VV/C2;
VVCC=VVCC/C2;

lam=lam+WW*dt;
CCC=(1+VVCC*dt)*CCC;
%x=M1+VV*dt;
x=MM1+1+VV*dt;

end

toc

POLmu=polyfit(tcl,mucl,4);
mucls=polyval(POLmu,tcl);
figure
plot(tcl,mucl,':g',tmc,mumc,'-r',tcl,mucls,'-g')
hm = findobj(gca,'Type','line','LineStyle','-');
legend(hm,'Eqn Free','Monte Carlo')
axis([0 2 0 1])

POLcc=polyfit(tcl,CCcl,4);
CCcls=polyval(POLcc,tcl);
figure
plot(tcl,CCcl,':g',tmc,CCmc,'-r',tcl,CCcls,'-g')
hc = findobj(gca,'Type','line','LineStyle','-');
```

```
legend(hc,'Eqn Free','Monte Carlo')
xlabel('time t')
ylabel('correlation C(t,0)')
title('Correlation Function C(t,0)=<x(t)x(0)>-<x(t)><x(0)> in the Doublewell↵
Model')
axis([0 2 0 1])

%plm=inline('exp(lm*x+x.^2/2-x.^4/4)','x','lm');
%POLlam=polyfit(tcl,lamcl,4);
%for ii=1:V+1
% tim=tobs(ii);
% lamcls=polyval(POLlam,tim);
% NNN=quad(@(x) plm(x,lamcls),-6,6,5e-16);
% figure
% plot(xx,plm(xx,lamcls)/NNN,'-b',xx,pin(xx),'-g',xx,peq(xx),'-r')
% axis([-4 4 0 1])
%end
```