FOURIER SERIES

syms n a x

assume(n, 'integer')

f=x^2;

L=1/3;

ao=int(f,x,0,1)/L

an=int(f\*cos(n\*pi\*x/L),x,0,1)/L;

an=subs(an,[cos(n\*pi),sin(pi\*n),cos(2\*n\*pi),sin(2\*pi\*n),cos(3\*n\*pi),sin(3\*pi\*n)],[(-1)^n,0,1,0,(-1)^n,0])

bn=int(f\*sin(n\*pi\*x/L),x,0,1)/L;

bn=subs(bn,[cos(n\*pi),sin(pi\*n),cos(2\*n\*pi),sin(2\*pi\*n),cos(3\*n\*pi),sin(3\*pi\*n)],[(-1)^n,0,1,0,(-1)^n,0])

ODE LAPLACE 1ST ORDER

syms x(t) s Xs X1

assume(t>0)

eqn = diff(x(t),t,1)-x==t;

eqnLT=laplace(eqn)

eqnLT = subs(eqnLT,laplace(x(t),t,s),Xs)

Xs = solve(eqnLT,Xs)

X1 = subs(Xs,x(0),1)

xsol = ilaplace(X1,s,t)

t1= linspace(0,1,21);

x\_val=subs(xsol,t,t1);

plot(t1,x\_val)

xlabel("t")

ylabel('x')

legend("x(t)")

ODE LAPLEACE 2ND ORDER

syms x(t) s Xs X1

assume(t>0)

eqn = diff(x(t),t,2)+x==sin(t);

eqnLT=laplace(eqn)

eqnLT = subs(eqnLT,laplace(x(t),t,s),Xs);

Xs = solve(eqnLT,Xs);

X1 = subs(Xs,[x(0), subs(diff(x,t),t,0)],[1,-1])

xsol = ilaplace(X1,s,t)

t1= linspace(0,2\*pi,21);

x\_val=subs(xsol,t,t1);

plot(t1,x\_val)

xlabel("t")

ylabel('x')

legend("x(t)")

FOURIER SERIES EX X^2

syms x

format SHORT

f = x^2;

N = 30; %number of terms in the Fourier series

a0 = double((1/pi)\*int(f,x,0,2\*pi))

a = [];b=[];

for n = 1:N

a =[a, double((1/pi)\*int(f\*cos(n\*x),x,0,2\*pi))];

b = [b, double((1/pi)\*int(f\*sin(n\*x),x,0,2\*pi))];

end

x\_val=linspace(0,6\*pi,201);

F=a0/2;

for n=1:N

F =double(F + a(n)\*cos(n\*x\_val)+b(n)\*sin(n\*x\_val));

end

plot(x\_val,F)

xlabel("x");

ylabel("f(x)");

LAPLACE TRANSFORM FOR SOLVING ODE

syms x(t) s Xs X1

assume(t>0)

eqn=diff(x(t),t,2)+x==sin(t);

eqnLT=laplace(eqn)

eqnLT=subs(eqnLT,laplace(x(t),t,s),Xs);

Xs=solve(eqnLT,Xs);

X1=subs(Xs,[x(0),subs(diff(x,t),t,0)],[1,-1])

xsol=ilaplace(X1,s,t)

FOURIER COEFFICIENTS