**HW1 MATLAB code**

2.

% f(t)

a0 = 0;

t = linspace(-3,4,1000);

T = 2;

f = a0\*ones(1,length(t));

for n = 1:20

an = 0;

bn = 2/(n\*pi)\*(1-(-1)^n);

f = f + an\*cos(2\*pi\*n.\*t/T) + bn\*sin(2\*pi\*n.\*t/T);

end

f\_true = square(pi\*t);

overshoot\_f = (max(abs(f))-1)/2;

figure(1);

plot(t,f,'--',t,f\_true);

title('f(t) (n=20)');

xlabel('t'); ylabel('f(t)');

axis([-3 4 -2 2]);

legend('Fourier series', 'True function')

% g(t)

a0 = 0;

t = linspace(-5\*pi,5\*pi,1000);

T = 2\*pi;

g = a0\*ones(1,length(t));

for n = 1:50

an = 0;

bn = -2/n\*(-1)^n;

g = g + an\*cos(2\*pi\*n.\*t/T) + bn\*sin(2\*pi\*n.\*t/T);

end

g\_true = pi\*sawtooth(t-pi);

overshoot\_g = (max(abs(g))-pi)/(2\*pi);

figure(2);

plot(t,g,'--',t,g\_true);

title('g(t) (n=50)');

xlabel('t'); ylabel('g(t)');

axis([-5\*pi 5\*pi -10 10]);

legend('Fourier series', 'True function')

% h(t)

a0 = 0.5;

t = linspace(-3,3,1000);

T = 2;

h = a0\*ones(1,length(t));

for n = 1:10

an = 2\*(1-(-1)^n)/(n\*pi)^2;

bn = 0;

h = h + an\*cos(2\*pi\*n.\*t/T) + bn\*sin(2\*pi\*n.\*t/T);

end

h\_true = -0.5\*sawtooth(pi\*t,1/2) + 0.5;

figure(3);

plot(t,h,'--',t,h\_true);

title('h(t) (n=10)');

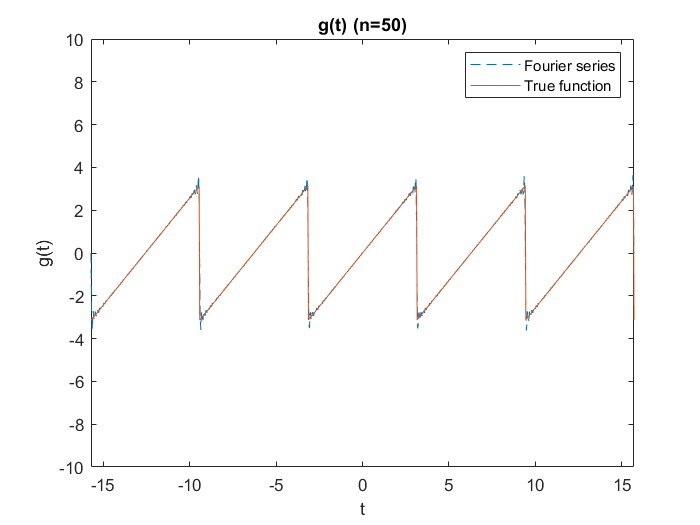
xlabel('t'); ylabel('h(t)');

axis([-3 3 -1 2]);

legend('Fourier series', 'True function')

Chart

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Chart, line chart

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Chart

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4.

f = linspace(-1.5,1.5,500);

f0 = 1;

for N = [3 5 10 30]

H = sin(pi\*(2\*N+1)\*f/f0)./sin(pi\*f/f0);

figure(find([3 5 10 30]==N));

plot(f,H);

title(sprintf('N = %d', N));

xlabel('f'); ylabel('H(f)');

end

Chart, histogram

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