MATLAB.6

Plotting Fourier Series
We plot the partial sums for the Fourier series for abs(x) on [-3,3].

First we compute the coefficients by hand.

\[ a(0)=3 , \]
\[ a(m)=-6*(1-(-1)^m)/(m*pi)^2 \quad \text{for } m\geq 1 , \]
\[ b(m)=0 . \]

Next we make an M-file for the nth partial sum.

**********************************************************************
function w=summ(x,n)

w=3/2;
for m=1:n
   w=w-cos(m*pi*x/3)*6*(1-(-1)^m)/(m*pi)^2;
end
**********************************************************************

We want to compare summ(x,n) with the 6-periodic extension of abs(x) (See the example in HW.3). Its M-file is

**********************************************************************
function w=f(x)
z=6*floor((x+3)/6);
y=x-z;
w=abs(y);
**********************************************************************

Now we go to the command window and plot summ(x,12) and f(x) on [-6,7]. We use "hold on" and "hold off" to plot the graphs together.

************************************************************************
hold on
fplot('summ(x,12)',[-6,7])
fplot('f(x)',[-6,7])
hold off;
************************************************************************

To see how far apart the graphs are find the maximum of abs(f(x)-summ(x,12)) . (See HW.2).

ASSIGNMENT 6 :

Let f(x)=x^2 for -2\leq x \leq 2 .
Find the Fourier series for $f$ on $[-2,2]$. Plot the partial series for $f, \text{sum}(x, 8)$ together with a plot of the 4-periodic extension of $f(x)$ on $[-5,6]$.

For what $n$ is the maximum of $\text{abs}(f(x) - \text{sum}(x, n))$ on $[-5,6]$ less than 0.1?