

## Plotting Fourier Series

We plot the partial sums for the Fourier series for  $\text{abs}(x)$  on  $[-3,3]$ .

First we compute the coefficients by hand.

$$\begin{aligned} a(0) &= 3, \\ a(m) &= -6 \cdot (1 - (-1)^m) / (m \cdot \pi)^2 \quad \text{for } m \geq 1, \\ b(m) &= 0. \end{aligned}$$

Next we make an M-file for the  $n$ th 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  $\text{summ}(x,n)$  with the 6-periodic extension of  $\text{abs}(x)$  ( 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  $\text{summ}(x,12)$  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  $\text{abs}(f(x) - \text{summ}(x,12))$  . ( See HW.2 ) .

### ASSIGNMENT 6 :

Let  $f(x) = x^2$  for  $-2 \leq x < 2$  .

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

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