

## **Workshop 4**

Afief Halumi  
302323001

## % Main.m

```
[x,p,x2,f]=afiefpoly(1);  
subplot(3,2,1);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
[x,p,x2,f]=afiefpoly(3);  
subplot(3,2,2);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
[x,p,x2,f]=afiefpoly(5);  
subplot(3,2,3);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
[x,p,x2,f]=afiefpoly(15);  
subplot(3,2,4);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
[x,p,x2,f]=afiefpoly(15);  
subplot(3,2,5);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
[x,p,x2,f]=afiefpoly(15);  
subplot(3,2,6);  
plot(x,p,x2,f);  
axis([-3*pi,3*pi,-3.5,3.5]);
```

```
print -dpng n1.png
```

## % afiefpoly.m

```
function [x,p,x2,f] = afiefpoly(n)

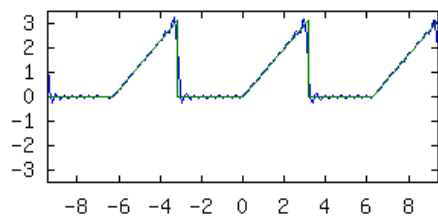
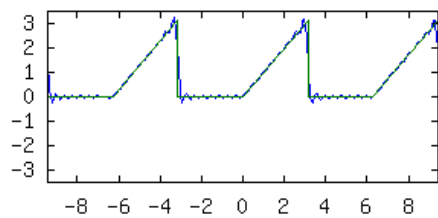
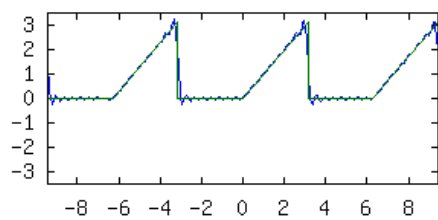
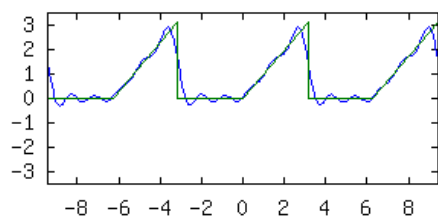
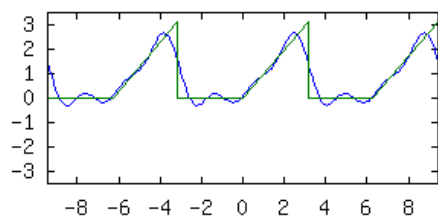
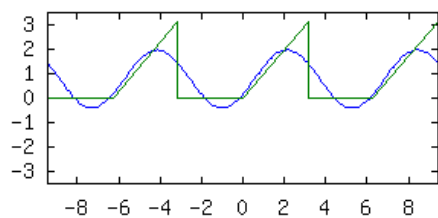
co = zeros(n+1,2);
x = -3*pi:0.1:3*pi;
p=zeros(length(x),1);

for k=1:n
    co(k,1)=((( -1)^k-1)/(k^2*pi));
    co(k,2)=((-1)^(k+1))/k;
end

for k=1:length(x)
    p(k)=pi/4;
    for j=1:n
        p(k)=p(k)+co(j,1)*cos(j*x(k))+co(j,2)*sin(j*x(k));
    end
end

x2=[-3*pi,-3*pi,-2*pi,-pi,-pi,0,pi,pi,2*pi,3*pi];
f=[pi,0,0,pi,0,0,pi,0,0,pi];
```

# Output



## Coefficient Calculation

$$a_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} 1 \cdot f(x) dx$$

$$a_0 = \frac{1}{\pi} \int_0^{\pi} x dx = \frac{1}{\pi} \cdot \frac{\pi^2}{2}$$

$$a_0 = \frac{\pi}{2}$$

$$a_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cdot \cos(kx) dx = \frac{1}{\pi} \left( \overbrace{\int_{-\pi}^0 0 \cdot \cos(kx) dx}^0 + \int_0^{\pi} x \cdot \cos(kx) dx \right)$$

$$a_k = \frac{1}{\pi} \int_0^{\pi} x \cdot \cos(kx) dx = \left[ \frac{k \cdot x \cdot \sin(kx) + \cos(kx)}{k^2} \right]_0^{\pi}$$

$$a_k = \frac{(-1)^k - 1}{\pi k^2}$$

$$b_k = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cdot \sin(kx) dx = \frac{1}{\pi} \int_0^{\pi} x \cdot \sin(kx) dx$$

$$b_k = \left[ \frac{\sin(kx) - k \cdot x \cdot \cos(kx)}{k^2} \right]_0^{\pi}$$

$$b_k = \frac{(-1)^{k+1}}{k}$$

$$g(x) = \frac{\pi}{4} + \sum_{k=0}^{\infty} \frac{(-1)^k - 1}{\pi k^2} \cos(kx) + \frac{(-1)^{k+1}}{k} \sin(kx)$$

## Notes

These results were obtained by using GNU Octave. Following are the legal notes concerning GNU Octave:

GNU Octave, version 3.0.1

Copyright (C) 2008 John W. Eaton and others.

This is free software; see the source code for copying conditions.

There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. For details, type `warranty'.

Octave was configured for "i486-pc-linux-gnu".

Additional information about Octave is available at <http://www.octave.org>.

Please contribute if you find this software useful.

For more information, visit <http://www.octave.org/help-wanted.html>

Report bugs to <[bug@octave.org](mailto:bug@octave.org)> (but first, please read <http://www.octave.org/bugs.html> to learn how to write a helpful report).

For information about changes from previous versions, type `news'.