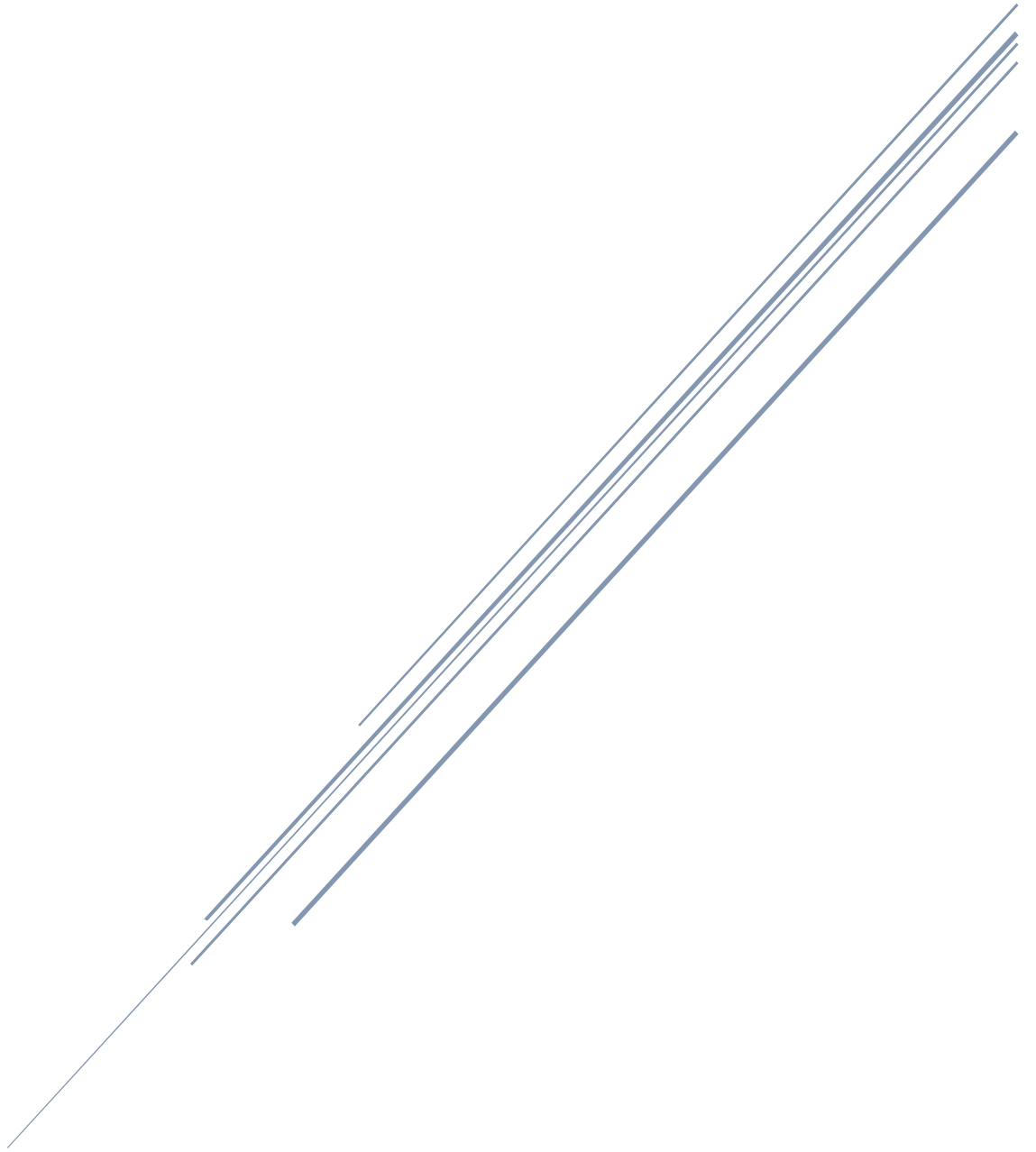


BLG354E – HOMEWORK 4



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1)

SaS4_Q1.m

```
function [a_k,k] =SaS4_Q1(K,N,P)
ks=0:1:K*P;

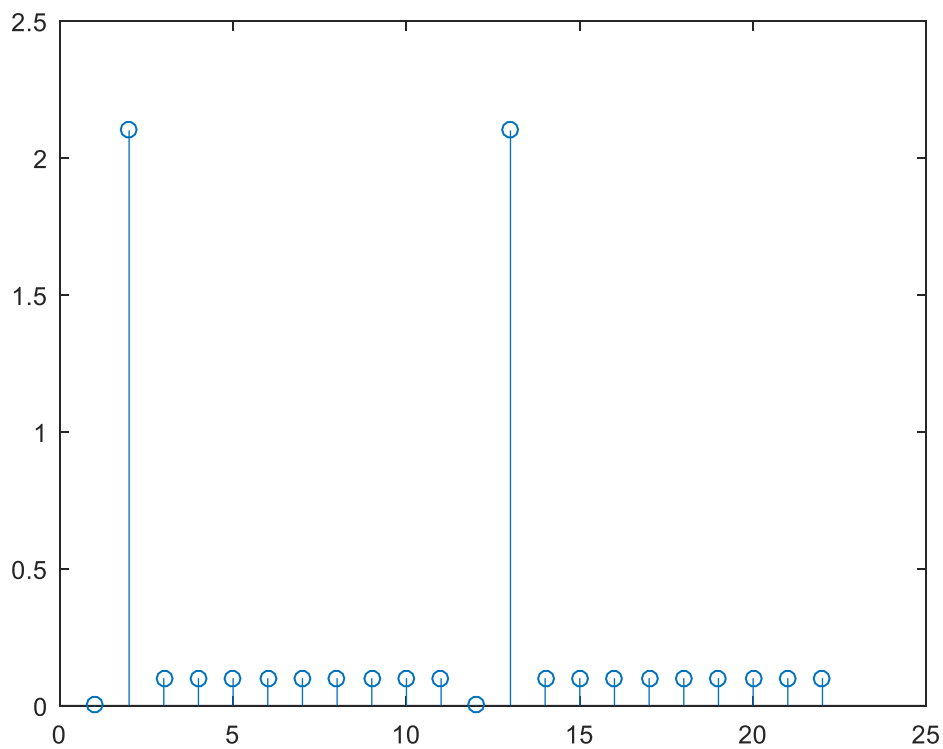
ind= N+1<=ks<=K*N-1;
x= @(ind)0;
ind= mod(abs(ks),K)<=N ;
x=@(ind)1;

plot(ks,x(ks));hold on;

%*****^Plot with period P ^*****

%***** *down* Find ak*****
syms n;
k=0;
a_k=0;
aks=0;
w0=2*pi/K;
for kk=0:K-1
    k=[k kk];
    aks=[ aks eval((1/K*symsum( x(n)*exp(-j*kk*w0*n),n,0,K*P ) ))];
    ak =aks(end);
    a_k=[a_k ak];
end
k=k(2:end);
a_k=a_k(2:end);
out=aks;
for a=1:P-1
    out=[out aks];
end
stem(out)
%***** print out ak's for values
end
```

a) for SaS4_Q1(10,1,2)



b)

SaS4_Q1b.m

```
SaS4_Q1(10,1,2);

t=-11:0.1:11;
y=0;
for n=1:10
y= y+ a_k(n)*exp(j*(n)*w0*mod(t,10));
end
plot(t,abs(y))
```

2)

SaS4_Q2.m

```
syms n;
x=@(n)3*sin(2*pi*n/7+pi/4); %main function to find coef
N=7; %period
w0=2*pi/7;
aks=0;
k=0;
for k=0:6
aks=[ aks eval((1/7*symsum( x(n)*exp(-j*k*w0*n),n,0,6 )))];
k
```

```
ak =aks(end)
end

aks=aks(2:end);
```

Output:

```
k =
    0
ak =
    0
k =
    1
ak =
    1.0607 - 1.0607i
k =
    2
ak =
    6.9389e-17 + 5.5511e-17i
k =
    3
ak =
    6.9389e-17 + 5.5511e-17i
k =
    4
ak =
    0
k =
    5
ak =
   -4.1633e-17 - 5.5511e-17i
k =
```

6

ak =

1.0607 + 1.0607i

3)

SaS4_Q3.m

```
syms t;
T=3;
t=0:.1:15;
f1=exp(-mod(t,T));
plot(t,f1)

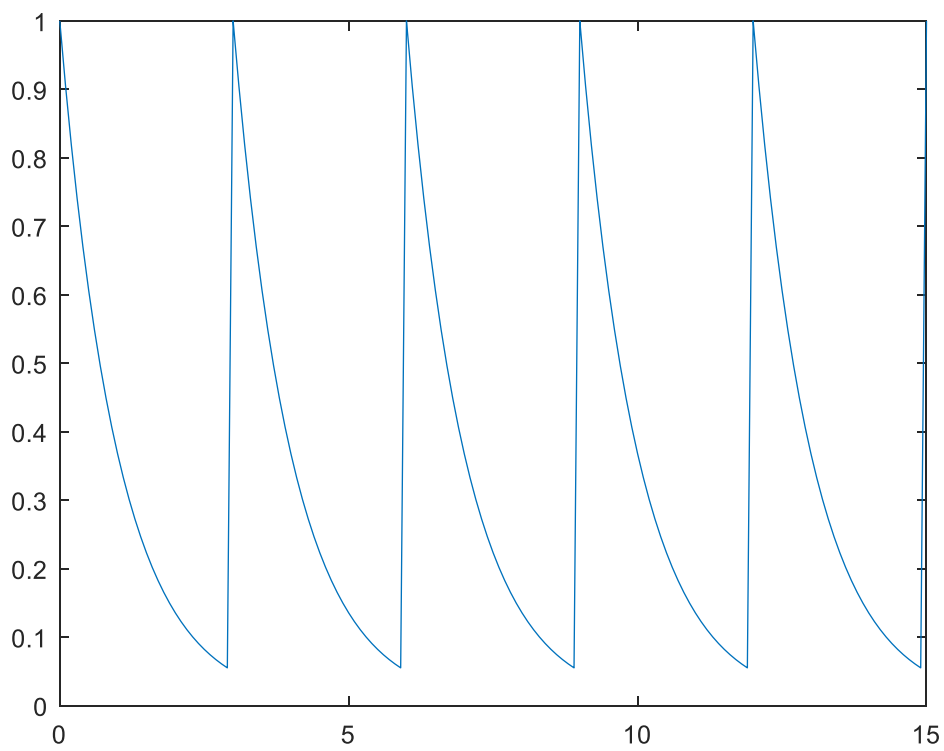
%***Part a is in up

w0=2*pi/3;
%ak=0;
aks=0;
fx=@(t,k) exp(-mod(t,T)).*exp(-j.*k*t*w0);
for k=-100:100
    k;
    ak = 1/3*integral( @(t)fx(t,k), 0,3);
    aks=[aks ak];
    X=[ real(k) , ak];
    disp( X )
end

%*****^Part b is in up

t=-11:0.1:11;
y=0;
for n=1:201
    y= y+ aks(n)*exp(j*(n-101)*w0*mod(t,T));
end
    plot(t,abs(y))
%*****^Part c is in up
```

a)



b)

1.0e+02 *

-1.0000 + 0.0000i 0.0000 + 0.0000i

-99.0000 + 0.0000i 0.0000 + 0.0015i

-98.0000 + 0.0000i 0.0000 + 0.0015i

-97.0000 + 0.0000i 0.0000 + 0.0016i

-96.0000 + 0.0000i 0.0000 + 0.0016i

-95.0000 + 0.0000i 0.0000 + 0.0016i

-94.0000 + 0.0000i 0.0000 + 0.0016i

-93.0000 + 0.0000i 0.0000 + 0.0016i

-92.0000 + 0.0000i 0.0000 + 0.0016i

-91.0000 + 0.0000i 0.0000 + 0.0017i

-90.0000 + 0.0000i 0.0000 + 0.0017i

-89.0000 + 0.0000i 0.0000 + 0.0017i

-88.0000 + 0.0000i 0.0000 + 0.0017i

-87.0000 + 0.0000i 0.0000 + 0.0017i

-86.0000 + 0.0000i 0.0000 + 0.0018i

-85.0000 + 0.0000i 0.0000 + 0.0018i

-84.0000 + 0.0000i 0.0000 + 0.0018i

-83.0000 + 0.0000i 0.0000 + 0.0018i

-82.0000 + 0.0000i 0.0000 + 0.0018i

-81.0000 + 0.0000i 0.0000 + 0.0019i

-80.0000 + 0.0000i 0.0000 + 0.0019i

-79.0000 + 0.0000i 0.0000 + 0.0019i

-78.0000 + 0.0000i 0.0000 + 0.0019i

$-77.0000 + 0.0000i$ $0.0000 + 0.0020i$

$-76.0000 + 0.0000i$ $0.0000 + 0.0020i$

$-75.0000 + 0.0000i$ $0.0000 + 0.0020i$

$-74.0000 + 0.0000i$ $0.0000 + 0.0020i$

$-73.0000 + 0.0000i$ $0.0000 + 0.0021i$

$-72.0000 + 0.0000i$ $0.0000 + 0.0021i$

$-71.0000 + 0.0000i$ $0.0000 + 0.0021i$

$-70.0000 + 0.0000i$ $0.0000 + 0.0022i$

$-69.0000 + 0.0000i$ $0.0000 + 0.0022i$

$-68.0000 + 0.0000i$ $0.0000 + 0.0022i$

$-67.0000 + 0.0000i$ $0.0000 + 0.0023i$

$-66.0000 + 0.0000i$ $0.0000 + 0.0023i$

$-65.0000 + 0.0000i$ $0.0000 + 0.0023i$

$-64.0000 + 0.0000i$ $0.0000 + 0.0024i$

$-63.0000 + 0.0000i$ $0.0000 + 0.0024i$

-62.0000 + 0.0000i 0.0000 + 0.0024i

-61.0000 + 0.0000i 0.0000 + 0.0025i

-60.0000 + 0.0000i 0.0000 + 0.0025i

-59.0000 + 0.0000i 0.0000 + 0.0026i

-58.0000 + 0.0000i 0.0000 + 0.0026i

-57.0000 + 0.0000i 0.0000 + 0.0027i

-56.0000 + 0.0000i 0.0000 + 0.0027i

-55.0000 + 0.0000i 0.0000 + 0.0027i

-54.0000 + 0.0000i 0.0000 + 0.0028i

-53.0000 + 0.0000i 0.0000 + 0.0029i

-52.0000 + 0.0000i 0.0000 + 0.0029i

-51.0000 + 0.0000i 0.0000 + 0.0030i

-50.0000 + 0.0000i 0.0000 + 0.0030i

-49.0000 + 0.0000i 0.0000 + 0.0031i

-48.0000 + 0.0000i 0.0000 + 0.0032i

-47.0000 + 0.0000i 0.0000 + 0.0032i

-46.0000 + 0.0000i 0.0000 + 0.0033i

-45.0000 + 0.0000i 0.0000 + 0.0034i

-44.0000 + 0.0000i 0.0000 + 0.0034i

-43.0000 + 0.0000i 0.0000 + 0.0035i

-42.0000 + 0.0000i 0.0000 + 0.0036i

-41.0000 + 0.0000i 0.0000 + 0.0037i

-40.0000 + 0.0000i 0.0000 + 0.0038i

-39.0000 + 0.0000i 0.0000 + 0.0039i

-38.0000 + 0.0000i 0.0000 + 0.0040i

-37.0000 + 0.0000i 0.0001 + 0.0041i

-36.0000 + 0.0000i 0.0001 + 0.0042i

-35.0000 + 0.0000i 0.0001 + 0.0043i

-34.0000 + 0.0000i 0.0001 + 0.0044i

-33.0000 + 0.0000i 0.0001 + 0.0046i

-32.0000 + 0.0000i 0.0001 + 0.0047i

-31.0000 + 0.0000i 0.0001 + 0.0049i

-30.0000 + 0.0000i 0.0001 + 0.0050i

-29.0000 + 0.0000i 0.0001 + 0.0052i

-28.0000 + 0.0000i 0.0001 + 0.0054i

-27.0000 + 0.0000i 0.0001 + 0.0056i

-26.0000 + 0.0000i 0.0001 + 0.0058i

-25.0000 + 0.0000i 0.0001 + 0.0060i

-24.0000 + 0.0000i 0.0001 + 0.0063i

-23.0000 + 0.0000i 0.0001 + 0.0066i

-22.0000 + 0.0000i 0.0001 + 0.0069i

-21.0000 + 0.0000i 0.0002 + 0.0072i

-20.0000 + 0.0000i 0.0002 + 0.0076i

-19.0000 + 0.0000i 0.0002 + 0.0080i

-18.0000 + 0.0000i 0.0002 + 0.0084i

-17.0000 + 0.0000i 0.0002 + 0.0089i

-16.0000 + 0.0000i 0.0003 + 0.0094i

-15.0000 + 0.0000i 0.0003 + 0.0101i

-14.0000 + 0.0000i 0.0004 + 0.0108i

-13.0000 + 0.0000i 0.0004 + 0.0116i

-12.0000 + 0.0000i 0.0005 + 0.0126i

-11.0000 + 0.0000i 0.0006 + 0.0137i

-10.0000 + 0.0000i 0.0007 + 0.0151i

-9.0000 + 0.0000i 0.0009 + 0.0168i

-8.0000 + 0.0000i 0.0011 + 0.0188i

-7.0000 + 0.0000i 0.0015 + 0.0215i

-6.0000 + 0.0000i 0.0020 + 0.0250i

-5.0000 + 0.0000i 0.0029 + 0.0300i

-4.0000 + 0.0000i 0.0044 + 0.0373i

-3.0000 + 0.0000i 0.0078 + 0.0492i

-2.0000 + 0.0000i 0.0171 + 0.0715i

-1.0000 + 0.0000i 0.0588 + 0.1232i

0 0.3167

1.0000 + 0.0000i 0.0588 - 0.1232i

2.0000 + 0.0000i 0.0171 - 0.0715i

3.0000 + 0.0000i 0.0078 - 0.0492i

4.0000 + 0.0000i 0.0044 - 0.0373i

5.0000 + 0.0000i 0.0029 - 0.0300i

6.0000 + 0.0000i 0.0020 - 0.0250i

7.0000 + 0.0000i 0.0015 - 0.0215i

8.0000 + 0.0000i 0.0011 - 0.0188i

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73.0000 + 0.0000i 0.0000 - 0.0021i

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$89.0000 + 0.0000i$ $0.0000 - 0.0017i$

$90.0000 + 0.0000i$ $0.0000 - 0.0017i$

$91.0000 + 0.0000i$ $0.0000 - 0.0017i$

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$94.0000 + 0.0000i$ $0.0000 - 0.0016i$

$95.0000 + 0.0000i$ $0.0000 - 0.0016i$

$96.0000 + 0.0000i$ $0.0000 - 0.0016i$

$97.0000 + 0.0000i$ $0.0000 - 0.0016i$

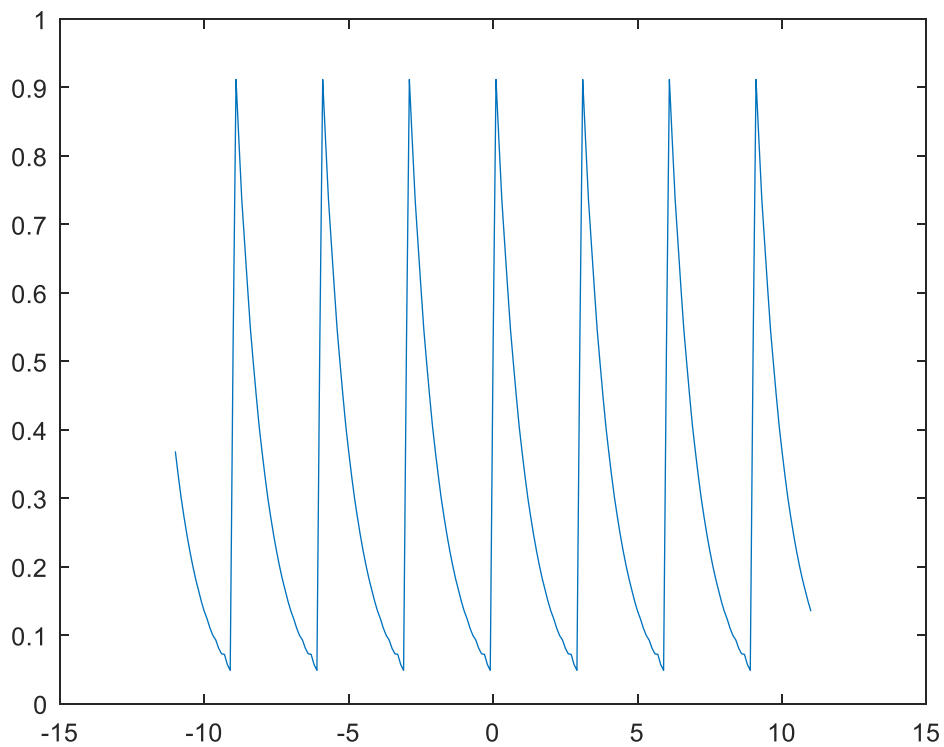
$98.0000 + 0.0000i$ $0.0000 - 0.0015i$

$99.0000 + 0.0000i$ $0.0000 - 0.0015i$

$1.0e+02 *$

$1.0000 + 0.0000i$ $0.0000 - 0.0000i$

c)

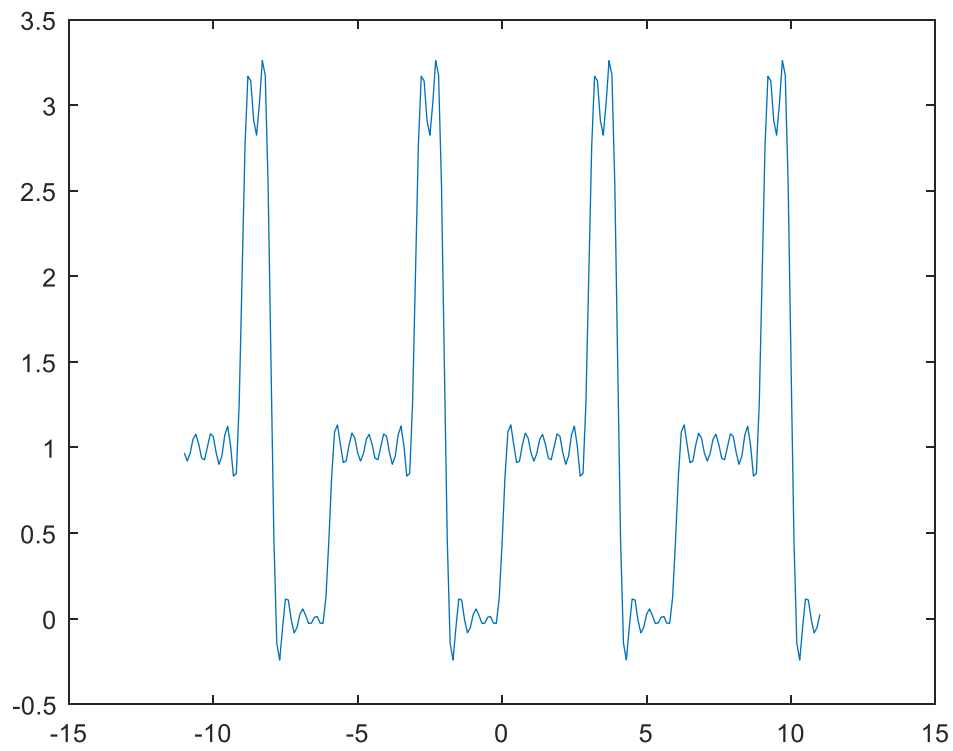


4)

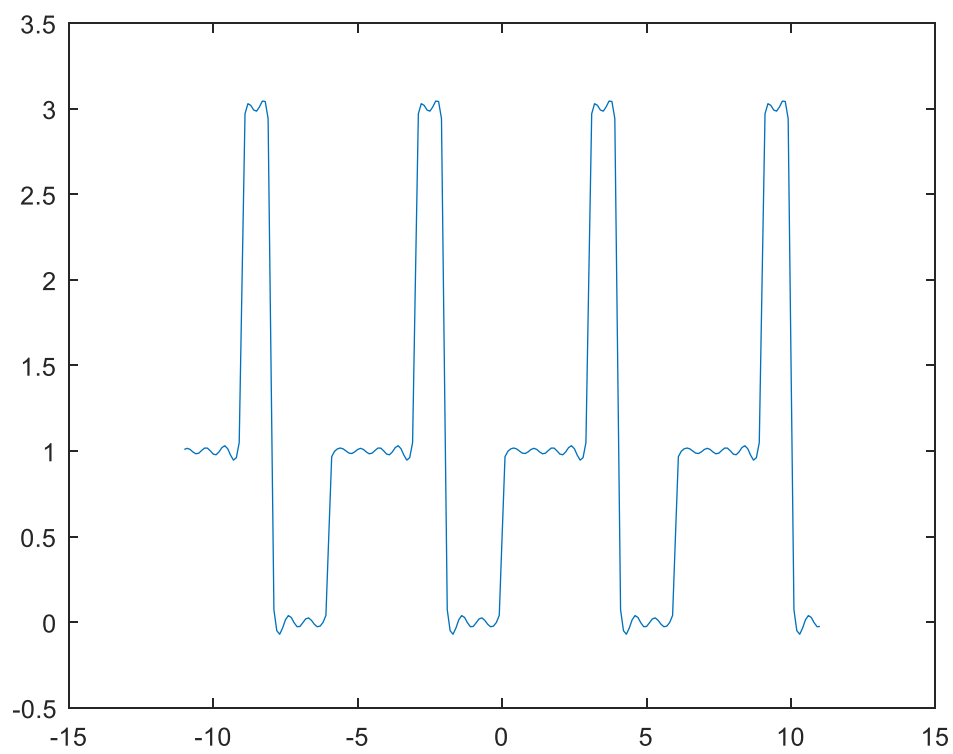
SaS4_Q4.m

```
function y = SaS_Q4(a,b)
    w0=pi/3;
    syms k;
    t = -11:.1:11;
    a0=1;
    y=a0+2*symsum( ((1/(2*k*j*pi))*( 1+2*exp(-j*k.*pi)-3*exp(-
j*k.*4*pi/3)))*exp(j*k*w0*t),k,[a b]);
    y;
    plot(t,y);
end
```

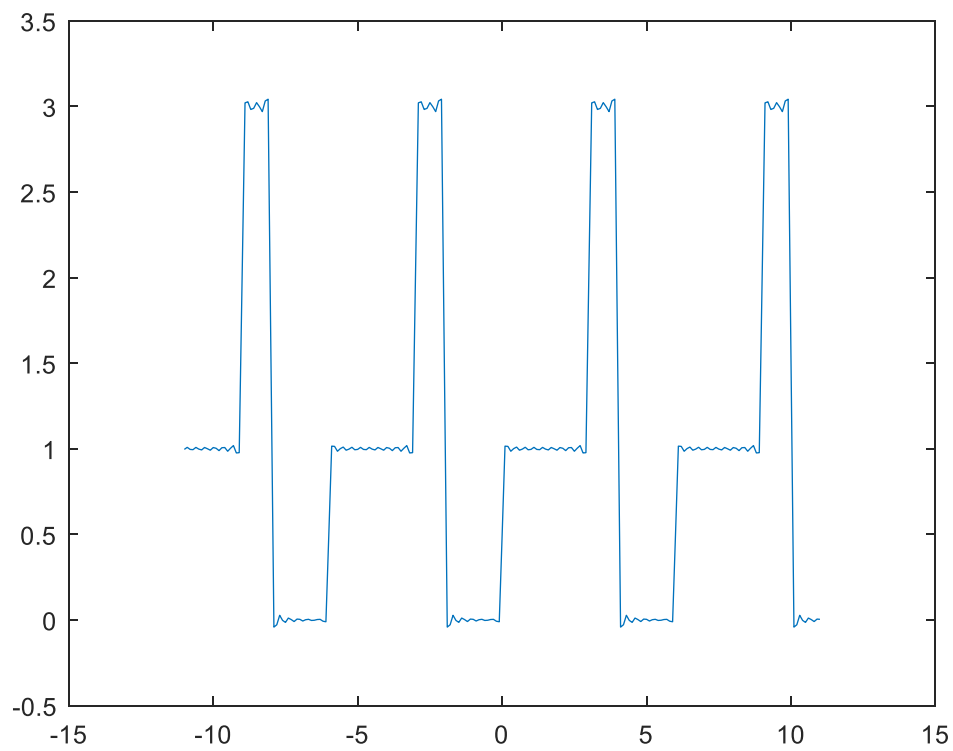
i) SaS_Q4(1,10)



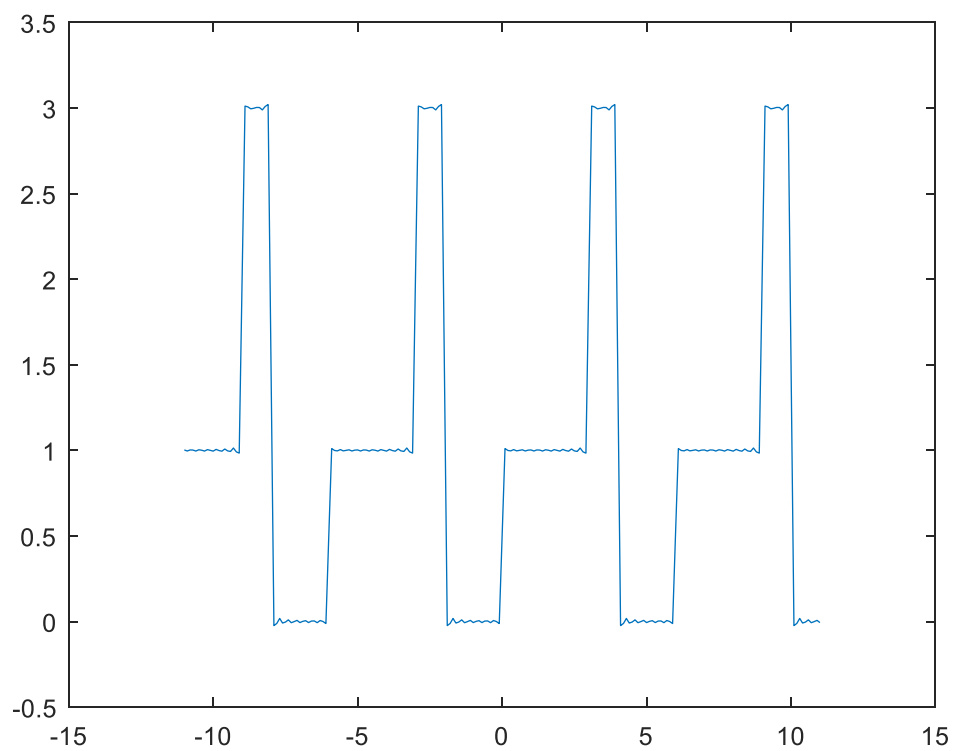
ii) SaS_Q4(1,50)



iii) SaS_Q4(1,100)



iv) `SaS_Q4(1,200)`



*Usage of more coefficients leads to a better representation of the original function