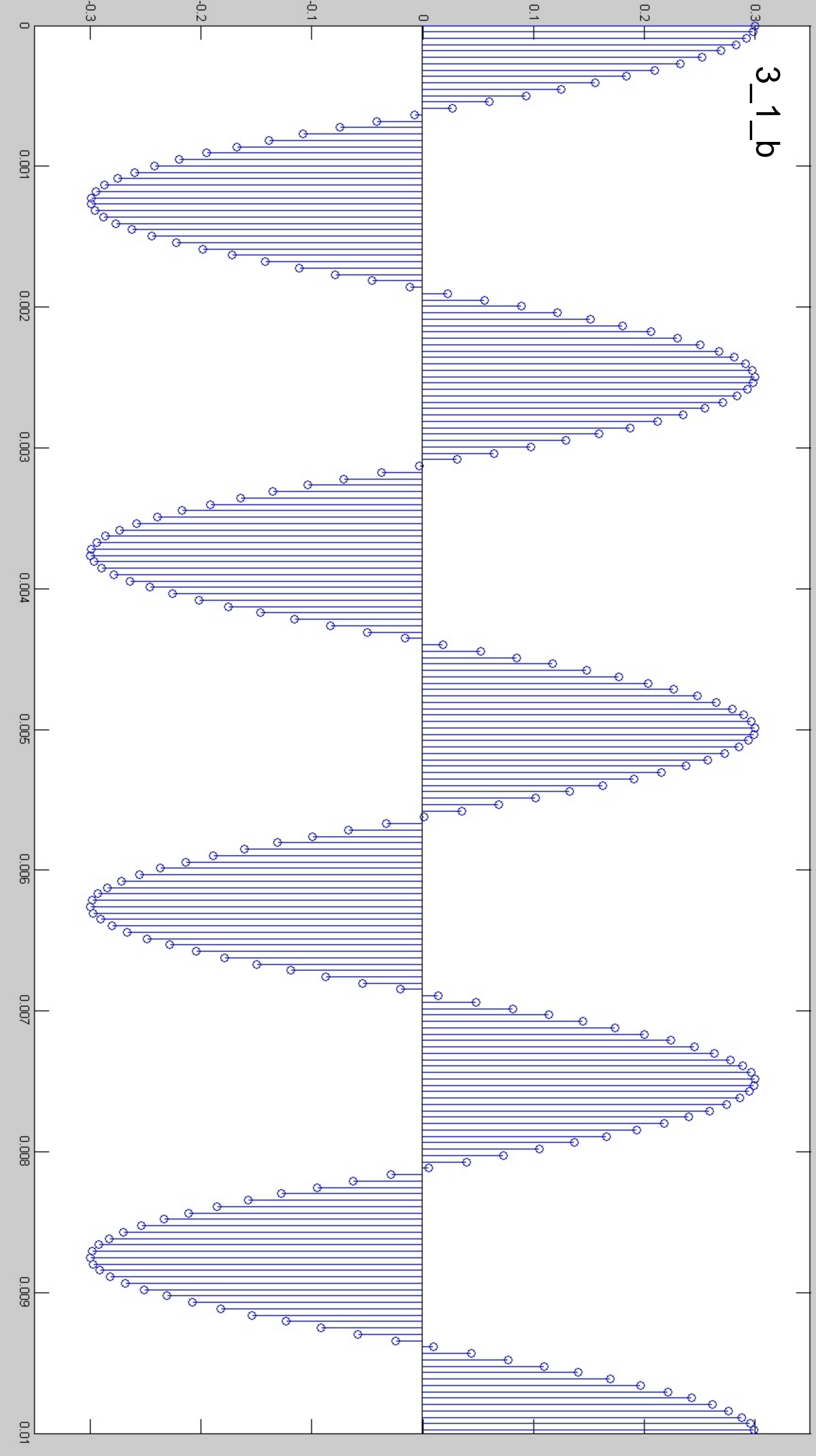


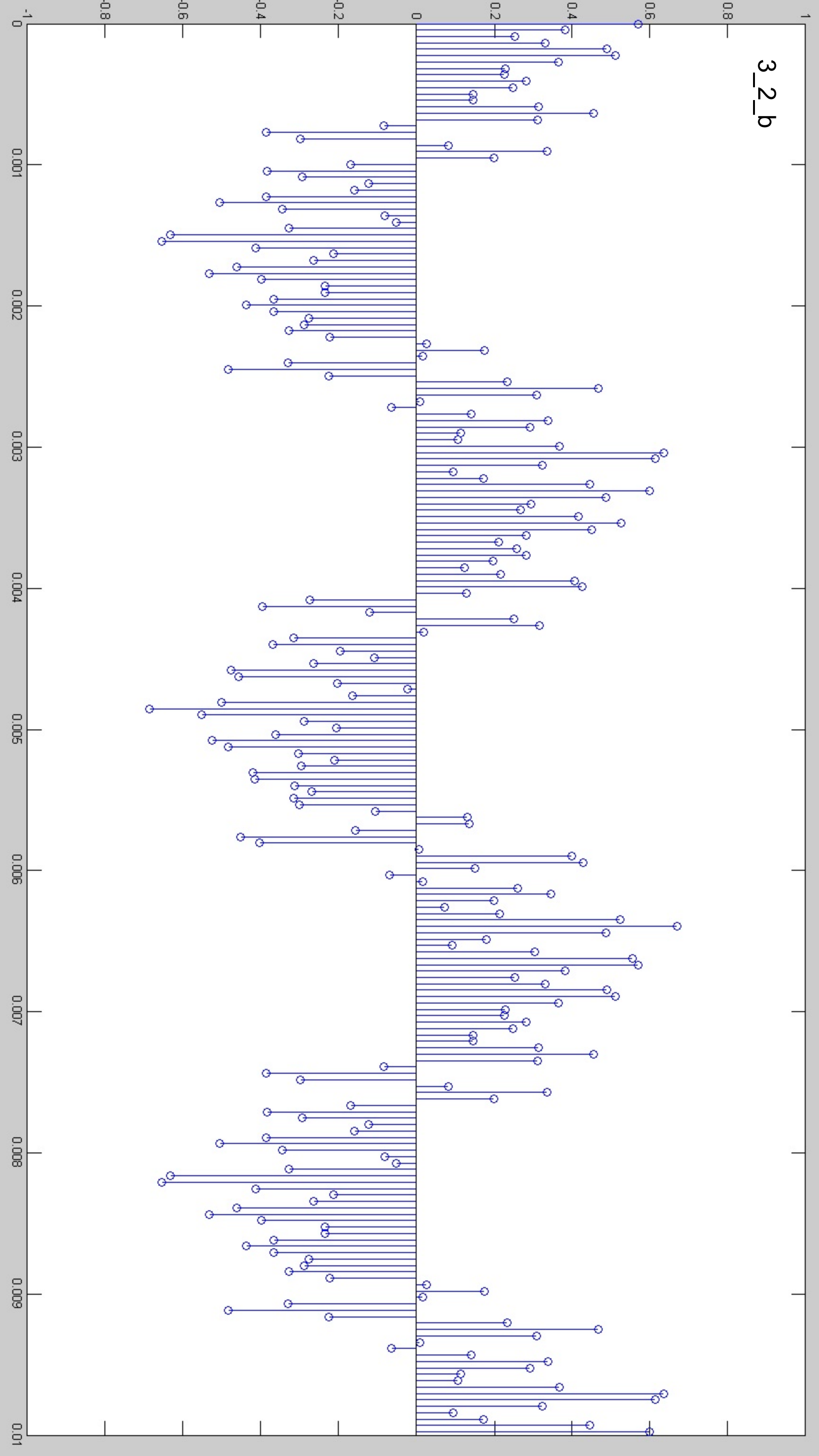
```
1  A = 0.3; %Amplitude
2  f0 = 400; %Frequenz in Hz
3  p = 0; %Phase
4  d = 3; %Dauer in s
5  fs = 22050; %Abtast Frequenz in Hz
6  vonx=0.0; %Plot Start x
7  bisx=0.01; %Plot Ende x
8  vony=-0.35; %Plot Start y
9  bisy=0.35; %Plot Ende y
10 %Definition der x Werte
11 x = 0:1/fs:d; % Array {Startwert, sekunde/abtastfrequenz, dauer}
12 %Definition y Werte
13 y = A*cos(2*pi*f0*x+p); %gegeben Funktion aus Aufgabe
14 %Plot erstellen
15 subplot(1,1,1);
16 %Funktion auf Plot Zeichnen
17 stem(x,y);
18 %Plot Skalieren (0.1 = 10ms) x -> 0 bis 0.1 // y -> -0.4 bis 0.4
19 axis([vonx bisx vony bisy]);
20 %Ton Ausgabe
21 sound(y,fs);
22
```

3_1_b



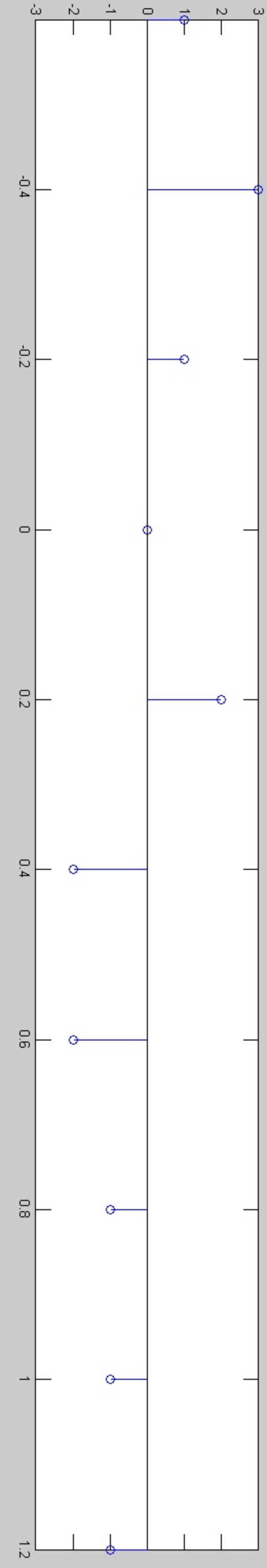
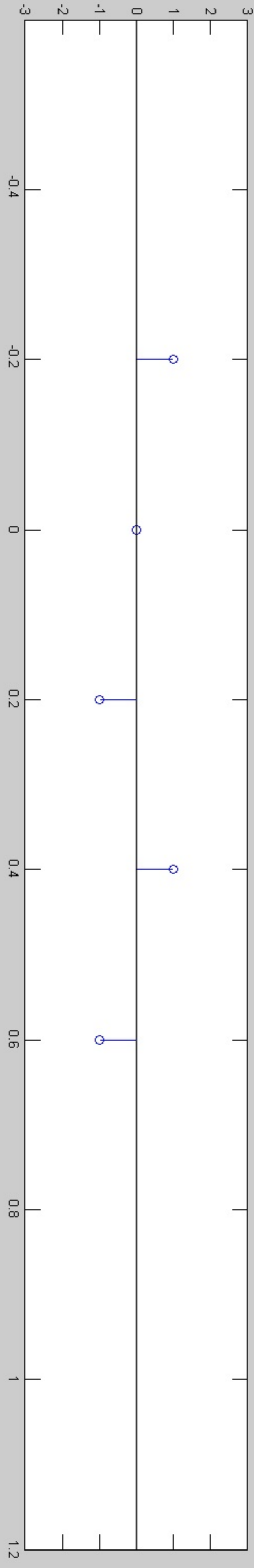
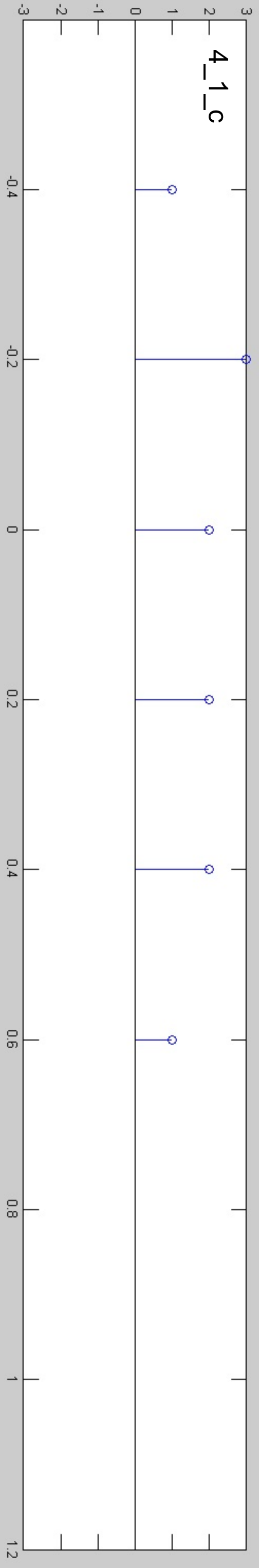
```
1  A = 0.3; %Amplitude
2  f0 = 300; %Frequenz in Hz
3  p = 0; %Phase
4  d = 3; %Dauer in s
5  fs = 22050; %Abtast Frequenz in Hz
6  vonx=0.0; %Plot Start x
7  bisx=0.01; %Plot Ende x
8  vony=-1; %Plot Start y
9  bisy=1; %Plot Ende y
10 %Definition der x Werte
11 x = 0:1/fs:d; % Array {Startwert, sekunde/abtastfrequenz, dauer}
12 xm = [0.1, 0.05, 0.05, 0.05, 0.2, 0.2, 0.05, 0.05, 0.05, 0.1];
13 xm_pi = [-1/3*pi, 1/3*pi, -1/4*pi, 2/3*pi, 0, 0, -2/3*pi, 1/4*pi, -1/3*pi,
14 1/3*pi];
15 m = [-14, -12, -10, -8, -1, 1, 8, 10, 12, 14];
16 signal_1=xm(1)*cos(2*pi*f0*m(1)*x+xm_pi(1));
17 signal_2=xm(2)*cos(2*pi*f0*m(2)*x+xm_pi(2));
18 signal_3=xm(3)*cos(2*pi*f0*m(3)*x+xm_pi(3));
19 signal_4=xm(4)*cos(2*pi*f0*m(4)*x+xm_pi(4));
20 signal_5=xm(5)*cos(2*pi*f0*m(5)*x+xm_pi(5));
21 signal_6=xm(6)*cos(2*pi*f0*m(6)*x+xm_pi(6));
22 signal_7=xm(7)*cos(2*pi*f0*m(7)*x+xm_pi(7));
23 signal_8=xm(8)*cos(2*pi*f0*m(8)*x+xm_pi(8));
24 signal_9=xm(9)*cos(2*pi*f0*m(9)*x+xm_pi(9));
25 signal_10=xm(10)*cos(2*pi*f0*m(10)*x+xm_pi(10));
26 y =
27 signal_1+signal_2+signal_3+signal_4+signal_5+signal_6+signal_7+signal_8+signal_9+signal_10;
28 %Definition y Werte
29
30 %Plot erstellen
31 subplot(1,1,1);
32 %Funktion auf Plot Zeichnen
33 stem(x,y);
34 %Plot Skalieren (0.1 = 10ms) x -> 0 bis 0.1 // y -> -0.4 bis 0.4
35 axis([vonx bisx vony bisy]);
36 %Ton Ausgabe
37 sound(y,fs);
```

3_2_b



```
1  h   = [1 0 -1 1 -1]; %samples
2  NHL = -0.2; %linker Rand
3  NHR = 0.6; %rechter Rand
4  IH   = 5; % breite
5  nh   = [-1 0 1 2 3]; %indexachse
6  th   = [-0.2 0.0 0.2 0.4 0.6]; %zeitachse
7
8
9  x   = [1 3 2 2 2 1]; %samples
10 NXL = -0.4; %linker Rand
11 NXR = 0.6; %rechter Rand
12 IX   = 5; % breite
13 nx   = [-2 -1 0 1 2 3]; %indexachse
14 tx   = [-0.4 -0.2 0.0 0.2 0.4 0.6]; %zeitachse
15
16
17 y = []; %samples
18 NYL = -0.6; %linker Rand
19 NYR = 1.2; %rechter Rand
20 IY   = 10; % breite
21 ny   = []; %indexachse
22 ty   = []; %zeitachse
23
24
25 fs = 22050; %Abtastfrequenz
26 T  = 1/fs; %Abtastabstand 1/fs
27
28
29 %zeitachse Start
30 ty(1) = NYL;
31 ty(IY) = NYR;
32 schritt = (abs(NYL)+abs(NYR)) / (IY-1);
33
34 for i=2:IY-1
35     ty(i) = NYL + ((i-1)*schritt);
36 end
37 %zeitachse Ende
38
39 %indexachse Start
40 for i=1:IY
41     ny(i) = ty(i)/schritt;
42 end
43
44 %indexachse Ende
45
46
47 z2=1;
48
49 for j=ny(1):1:ny(1)+IY-1
50
51     z1 = 1; % Zähler
52     eintrag = 0;
53     for i=nh(1):1:nh(1)+IH
54         h_ind = find(nh == i);
55
56         temp = j-i;
57         x_ind = find(nx == temp);
58
59         if isempty(h_ind)
60             E(z1) = 0;
61
62         elseif isempty(x_ind)
63             E(z1) = 0;
64
65         else
66
67             E(z1) = h(h_ind) * x(x_ind);
68         end
59     end
end
```

```
69
70     eintrag = eintrag+E(z1);
71     z1 = z1+1;
72 end
73
74
75
76
77
78     y(z2) = eintrag;
79     z2=z2+1;
80 end
81
82 subplot(3,1,1)
83 stem(nx,x)
84 axis([-3,6,-3,3])
85 subplot(3,1,2)
86 stem(nh,h)
87 axis([-3,6,-3,3])
88 subplot(3,1,3)
89 stem(ny,y)
90 axis([-3,6,-3,3])
91
92 figure
93 subplot(3,1,1)
94 stem(tx,x)
95 axis([-0.6,1.2,-3,3])
96 subplot(3,1,2)
97 stem(th,h)
98 axis([-0.6,1.2,-3,3])
99 subplot(3,1,3)
100 stem(ty,y)
101 axis([-0.6,1.2,-3,3])
```



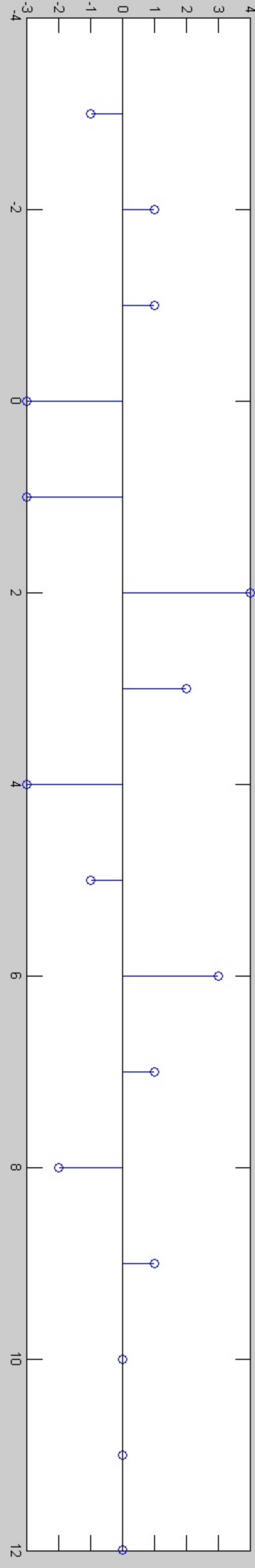
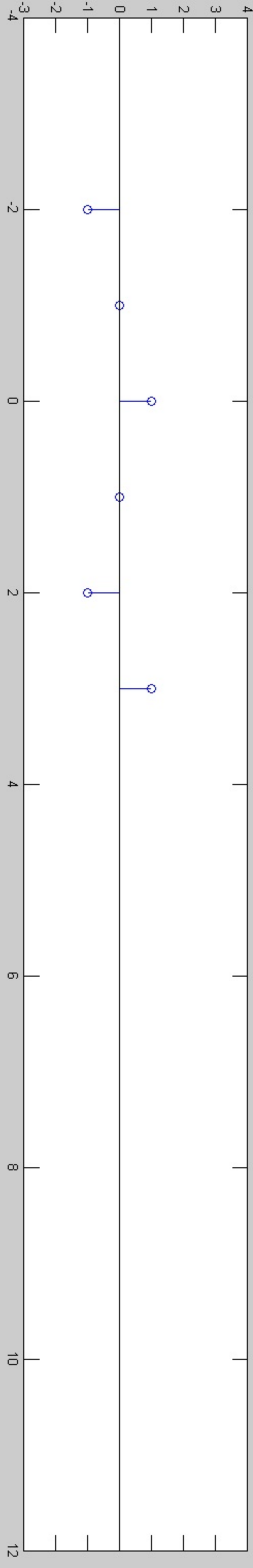
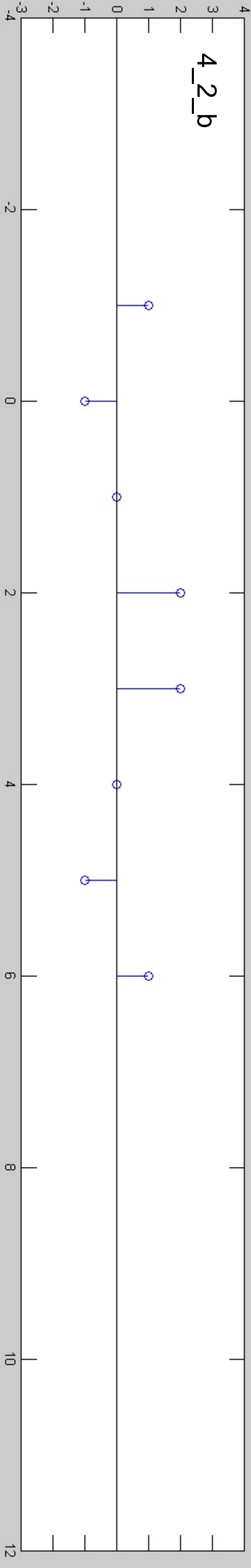
```

1  h = [-1 0 1 0 -1 1]; %samples
2  NHL = -0.2; %linker Rand
3  NHR = 0.3; %rechter Rand
4  IH = 6; % breite
5  nh = [-2 -1 0 1 2 3]; %indexachse
6  th = [-0.2 -0.1 0.0 0.1 0.2 0.3]; %zeitachse
7
8
9  x = [1 -1 0 2 2 0 -1 1]; %samples
10 NXL = -0.1; %linker Rand
11 NXR = 0.6; %rechter Rand
12 IX = 7; % breite
13 nx = [-1 0 1 2 3 4 5 6]; %indexachse
14 tx = [-0.1 0.0 0.1 0.2 0.3 0.4 0.5 0.6]; %zeitachse
15
16
17 y = []; %samples
18 NYL = -0.3; %linker Rand
19 NYR = 1.2; %rechter Rand
20 IY = 16; % breite
21 ny = []; %indexachse
22 ty = []; %zeitachse
23
24 fs = 22050; %Abtastfrequenz
25 T = 1/fs; %Abtastabstand 1/fs
26
27 %zeitachse Start
28 ty(1) = NYL;
29 ty(IY) = NYR;
30 schritt = (abs(NYL)+abs(NYR)) / (IY-1);
31
32 for i=2:IY-1
33     ty(i) = NYL + ((i-1)*schritt);
34 end
35 %zeitachse Ende
36
37
38 %indexachse Start
39 for i=1:IY
40     ny(i) = ty(i)/schritt;
41 end
42 %indexachse Ende
43
44
45 z2=1;
46 for j=ny(1):1:ny(1)+IY-1
47     z1 = 1; % Zähler
48     eintrag = 0;
49
50     for i=nh(1):1:nh(1)+IH
51         h_ind = find(nh == i);
52         temp = j-i;
53         temp = round(temp)
54         x_ind = find(nx == temp);
55         if isempty(h_ind)
56             E(z1) = 0;
57         elseif isempty(x_ind)
58             E(z1) = 0;
59         else
60
61             E(z1) = h(h_ind) * x(x_ind);
62
63         end
64         eintrag = eintrag+E(z1);
65         z1 = z1+1;
66     end
67
68     y(z2) = eintrag;

```



```
69     z2=z2+1;
70 end
71
72
73 subplot(3,1,1)
74 stem(nx,x)
75 axis([-4,12,-3,4])
76 subplot(3,1,2)
77 stem(nh,h)
78 axis([-4,12,-3,4])
79 subplot(3,1,3)
80 stem(ny,y)
81 axis([-4,12,-3,4])
82
83 figure
84 subplot(3,1,1)
85 stem(tx,x)
86 axis([-0.6,1.2,-3,3])
87 subplot(3,1,2)
88 stem(th,h)
89 axis([-0.6,1.2,-3,3])
90 subplot(3,1,3)
91 stem(ty,y)
92 axis([-0.6,1.2,-3,3])
```



```
1  h = [0.05 0.1 0.05 0.1 0.15 0.15 0.35 0.15 0.15 0.1 0.05 0.1 0.05]; %samples
2  NHL = 0; %linker Rand
3  NHR = 12 %rechter Rand
4  IH = 13; % breite
5
6  nh = 0:1:12; %indexachse
7  th = 0:1:12; %zeitachse
8
9  [wz, wfs, wbits]=wavread('MENU.WAV');
10 x=wz;
11 NXL = 0; %linker Rand
12 NXR = length(x)-1; %rechter Rand
13 IX = length(x); % breite
14 nx = 0:1:length(x)-1; %indexachse
15 tx = 0:1:length(x)-1; %zeitachse
16
17
18 y = []; %samples
19 NYL = 0; %linker Rand
20 NYR = 500; %rechter Rand
21 IY = 501; % breite
22 ny = []; %indexachse
23 ty = []; %zeitachse
24
25 fs = wfs;%Abtastfrequenz
26 T = 1/fs; %Abtastabstand 1/fs
27
28 %zeitachse Start
29 ty(1) = NYL;
30 ty(IY) = NYR;
31 schritt = (abs(NYL)+abs(NYR)) / (IY-1);
32
33 for i=2:1:(IY-1)
34     ty(i) = NYL + ((i-1)*schritt);
35 end
36 %zeitachse Ende
37
38
39 %indexachse Start
40 for i=1:1:IY
41     ny(i) = ty(i)/schritt;
42 end
43 %indexachse Ende
44
45
46 z2=1;
47 for j=ny(1):1:ny(1)+IY-1
48     z1 = 1; % Zähler
49     eintrag = 0;
50
51     for i=nh(1):1:nh(1)+IH
52         h_ind = find(nh == i);
53         temp = j-i;
54         temp = fix(100*temp)/100;
55         x_ind = find(nx == temp);
56         if isempty(h_ind)
57             E(z1) = 0;
58         elseif isempty(x_ind)
59             E(z1) = 0;
60         else
61
62             E(z1) = h(h_ind) * x(x_ind);
63
64         end
65         eintrag = eintrag+E(z1);
66         z1 = z1+1;
67     end
68
```

```
69     y(z2) = eintrag;
70     z2=z2+1;
71 end
72
73 subplot(3,1,1)
74 stem(nx,x)
75 axis([-4,12,-3,4])
76 subplot(3,1,2)
77 stem(nh,h)
78 axis([-4,12,-3,4])
79 subplot(3,1,3)
80 stem(ny,y)
81 axis([-4,12,-3,4])
82
83 figure
84 subplot(3,1,1)
85 stem(tx,x)
86 axis([0,length(x),-1,1])
87 subplot(3,1,2)
88 stem(th,h)
89 axis([0,12,-0.5,0.5])
90 subplot(3,1,3)
91 stem(ty,y)
92 axis([0,499,-0.05,0.05])
```

