Appendices:

Appendix A: Figure of Impulse Response Part

```
range = -10:50;
impulse_1 = (7/8).^(range).*(range >= 4);

% Plot the impulse response
figure;
stem(range, impulse_1, 'filled');
xlabel('n');
ylabel('h[n]');
title('Impulse Response h[n] = (7/8)^n u[n-4]');
grid on;

```

Figure 1: MatLab Code of Impulse Response

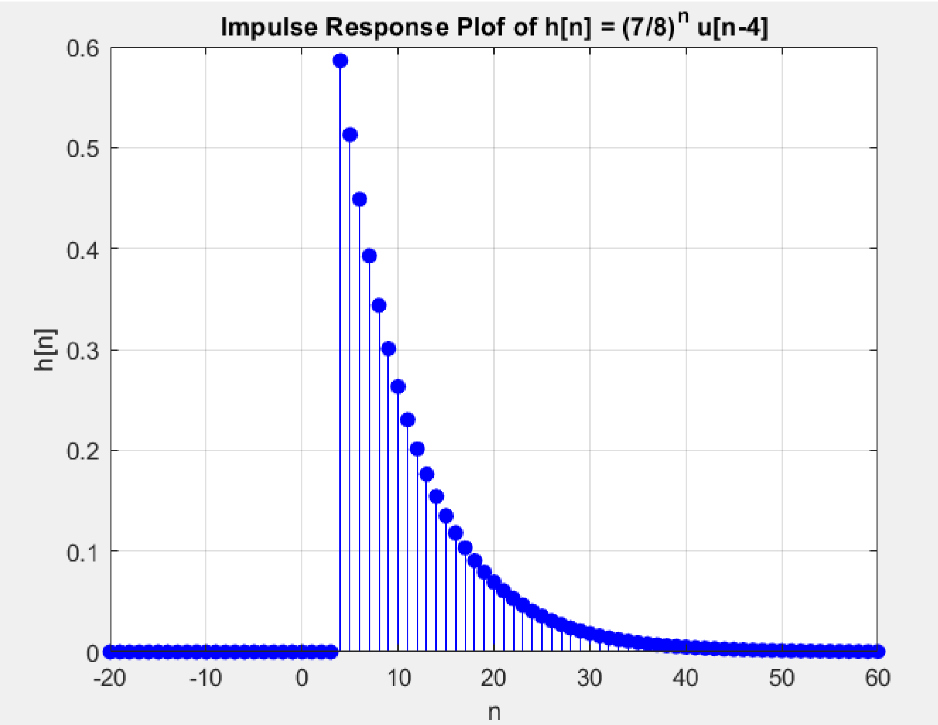

Figure 2: Impulse Response Plot

Appendix B: Figures of Question 1.a

```
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);
x1 = zeros(size(r));
x1((r <= 8) & (r >= 0)) = 3;
y1 = zeros(size(r));
for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x1(k+(range1/2)+1);
    y1 = y1 + a;
end

% Plot Numerical Result
figure;
stem(-10:50, y1(41:101), 'filled');
xlabel('n');
ylabel('y[n] = h[n]*x1[n]');
title('Numerical Result of y_1[n]');
grid on;

% Analytic Result
range2 = -10:100;
y1_2 = zeros(size(range2));
y1_2((range2 >= 4) & (range2 <= 12)) = 24 * ((7/8).^4 - (7/8).^(5:13));
y1_2((range2 >= 12)) = 24 * ((7/8).^(4:92) - (7/8).^(13:101));

% Plot Analytic Result
figure;
stem((-10:50), y1_2(1:61), 'filled', 'r');
xlabel('n');
ylabel('y[n] = T[x1[n]]');
title('Analytical Result of y_1[n]');
grid on;
```

Figure 3: MatLab Code of Question 1.a

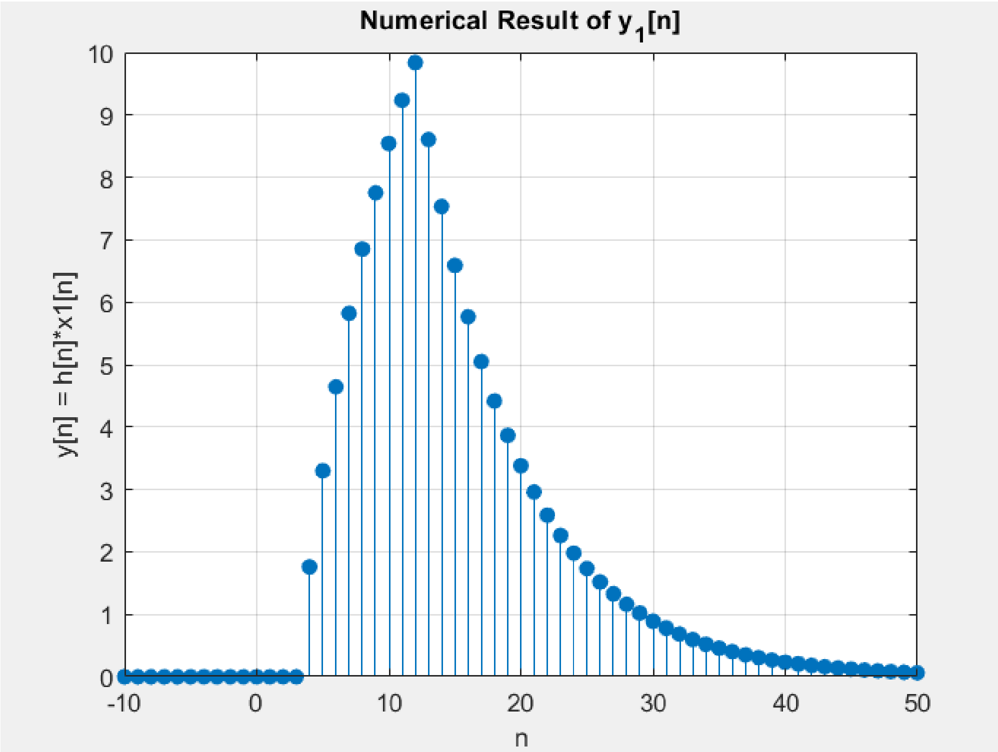

Figure 4: Plot of Numerical Result of y1[n]

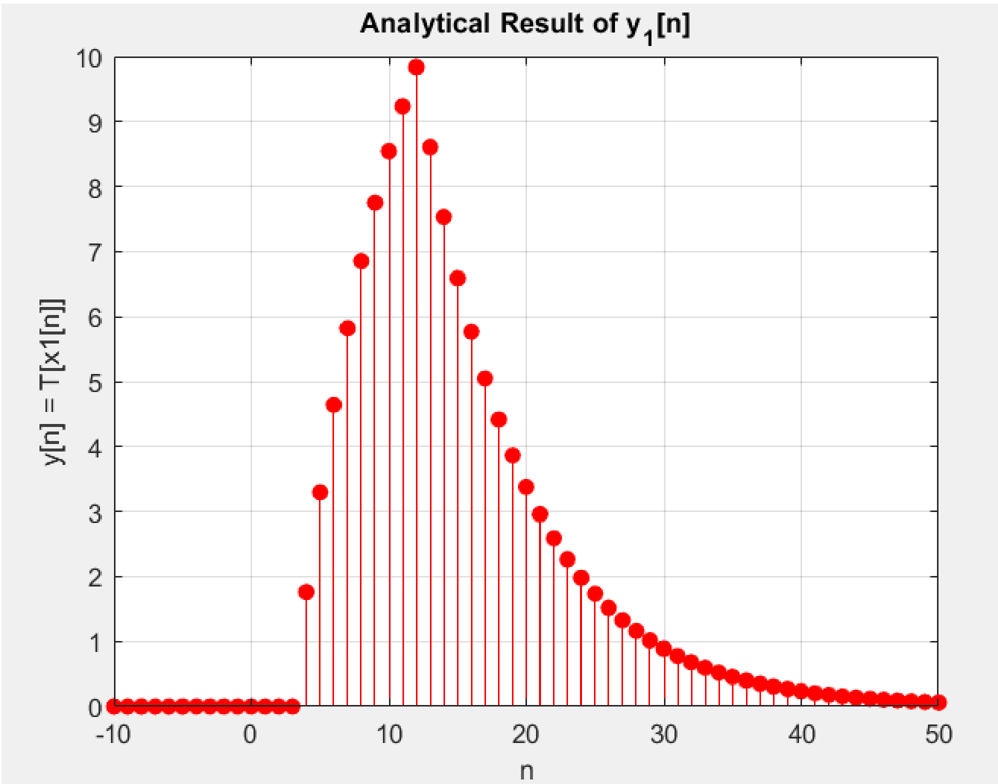

Figure 5: Plot of Analytical Result of y1[n]

Appendix C: Figures of Question 1.b

```
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);
x2 = zeros(size(r));
x2((r <= 4) & (r >= 0)) = 3;
x2((r <= 8) & (r >= 5)) = -3;
x2((r <= 13) & (r >= 9)) = -6;
y2 = zeros(size(r));
for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x2(k+(range1/2)+1);
    y2 = y2 + a;
end

% Plot Numerical Result
figure;
stem(-10:50, y2(41:101), 'filled');
xlabel('n');
ylabel('y[n] = h[n]*x2[n]');
title('Numerical Result of y_2[n]');
grid on;

% Analytic Result
range2 = -10:100;
y2_2 = zeros(size(range2));
y2_2((range2 >= 4) & (range2 <= 9)) = 24 * ((7/8).^4 - (7/8).^(5:10));
y2_2((range2 >= 9) & (range2 <= 12)) = 24 * ((7/8).^4 - (7/8).^(10:13))-48*((7/8).^4 - (7/8).^(5:8));
y2_2((range2 >= 12) & (range2 <= 17)) = 24 * ((7/8).^(4:9) - (7/8).^(13:18))-48*((7/8).^4 - (7/8).^(8:13));
y2_2(range2 >= 17) = 24 * ((7/8).^(9:92) - (7/8).^(18:101))-48*((7/8).^(4:87) - (7/8).^(13:96));

% Plot Analytic Result
figure;  % Open another figure window
stem((-10:50), y2_2(1:61), 'filled', 'r');
xlabel('n');
ylabel('y[n] = T[x2[n]]');
title('Analytical Result of y_2[n]' );
grid on;
```

Figure 6: MatLab Code of Question 1.b

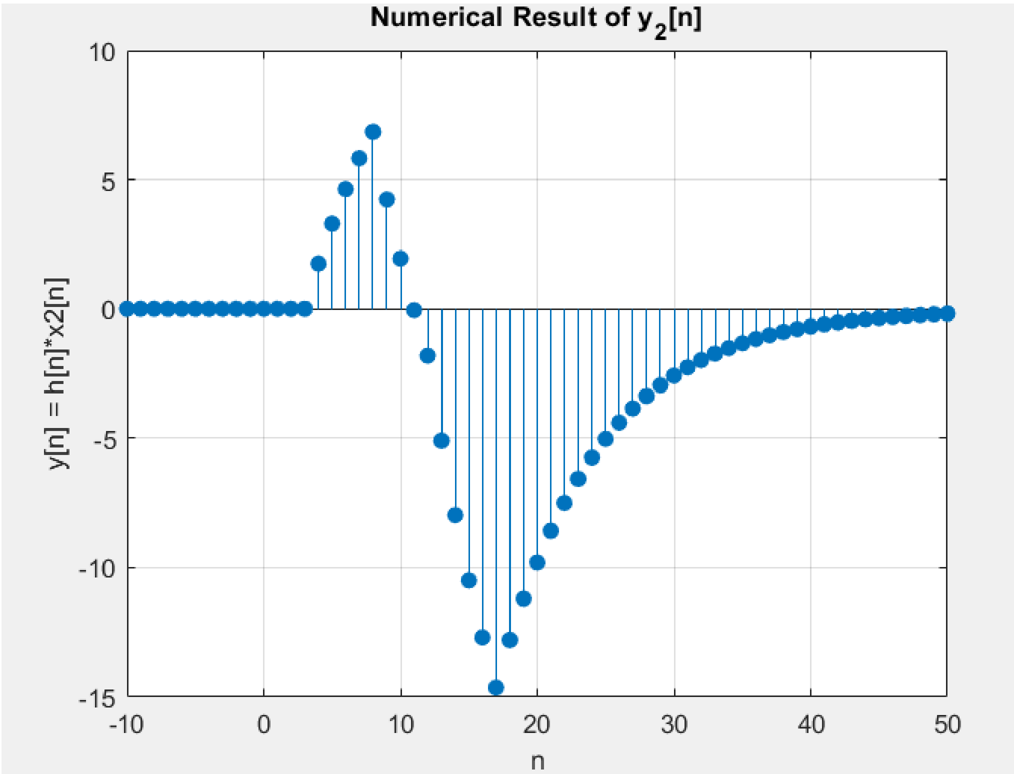

Figure 7: Plot of Numerical Result of y2[n]

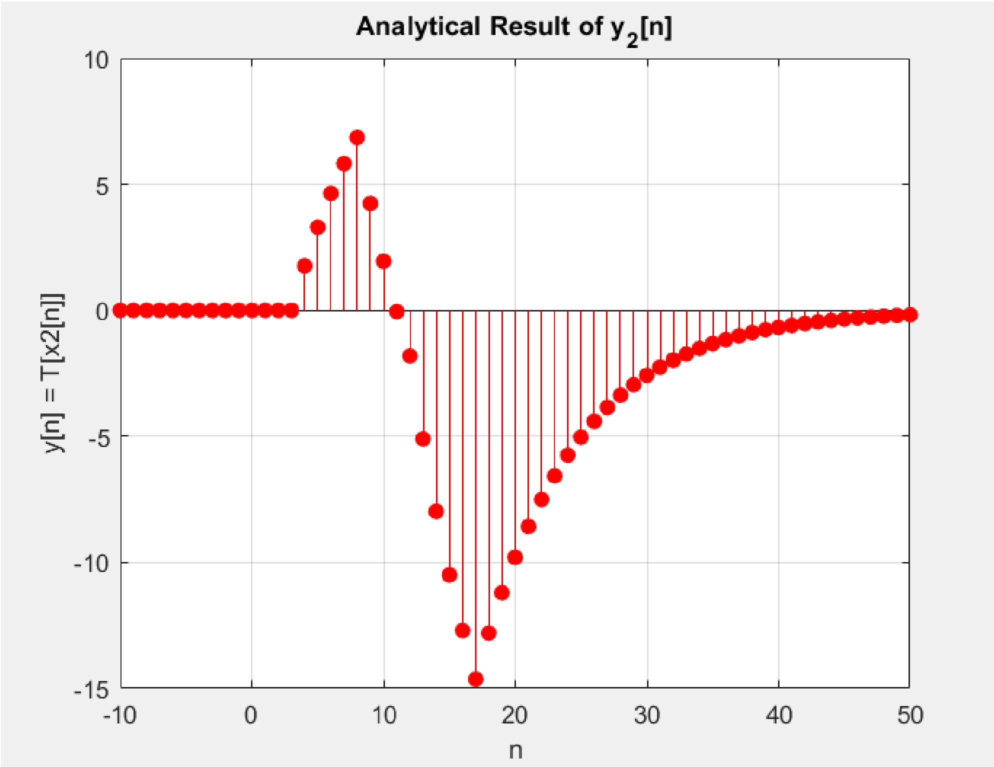

Figure 8: Plot of Analytical Result of y2[n]

Appendix D: Figures of Question 1.c

```matlab
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);
x3 = zeros(size(r));
x3((r <= 20) & (r >= 2)) = exp((2:20).*1/3*1i);
y3 = zeros(size(r));
for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x3(k+(range1/2)+1);
    y3 = y3 + a;
end

% Plot Numerical Result
figure;  % Open a new figure window
stem(r,real(y3),'filled');
xlabel('n');
ylabel('Real Part of y[n] = h[n]*x3[n]');
title('Numerical Result for Real Part of y_3[n]');
grid on;

figure;
stem(r,imag(y3),'filled');
xlabel('n');
ylabel('Imaginery Part of y[n] = h[n]*x3[n]');
title('Numerical Result for Imaginary Part of y_3[n]');
grid on;

```

Figure 9: MatLab Code of Question 1.c

```matlab
% Parameters
range2 = -10:100;
y3_2 = zeros(size(range2));
j = sqrt(-1);

y3_2((range2 >= 6) & (range2 <= 24)) = (exp(j/3).^range2((range2 >= 6) & (range2 <= 24))) .* ...
    (((7/8) * exp(-j/3))^4 - ((7/8) * exp(-j/3)).^(range2((range2 >= 6) & (range2 <= 24)) - 1)) ...
    / (1 - (7/8) * exp(-j/3));

y3_2((range2 >= 24)) = (exp(j/3).^range2((range2 >= 24))) .* ...
    (((7/8) * exp(-j/3)).^(range2((range2 >= 24)) - 20) - ((7/8) * exp(-j/3)).^(range2((range2 >= 24)) - 1)) ...
    / (1 - (7/8) * exp(-j/3));

% Plot the result
figure;
stem((-10:50), real(y3_2(1:61)), 'filled', 'r');  % Plot real part of y3[n]
xlabel('n');
ylabel('Real Part of y3[n]');
title('Analytical Result for Real Part y3[n]');
grid on;


% Plot the result
figure;
stem((-10:50), imag(y3_2(1:61)), 'filled', 'r');  % Plot real part of y3[n]
xlabel('n');
ylabel('Imaginary Part of y3[n]');
title('Analytical Result for Imaginary Part for y3[n]');
grid on;
```

Figure 10: MatLab Code of Question 1.c

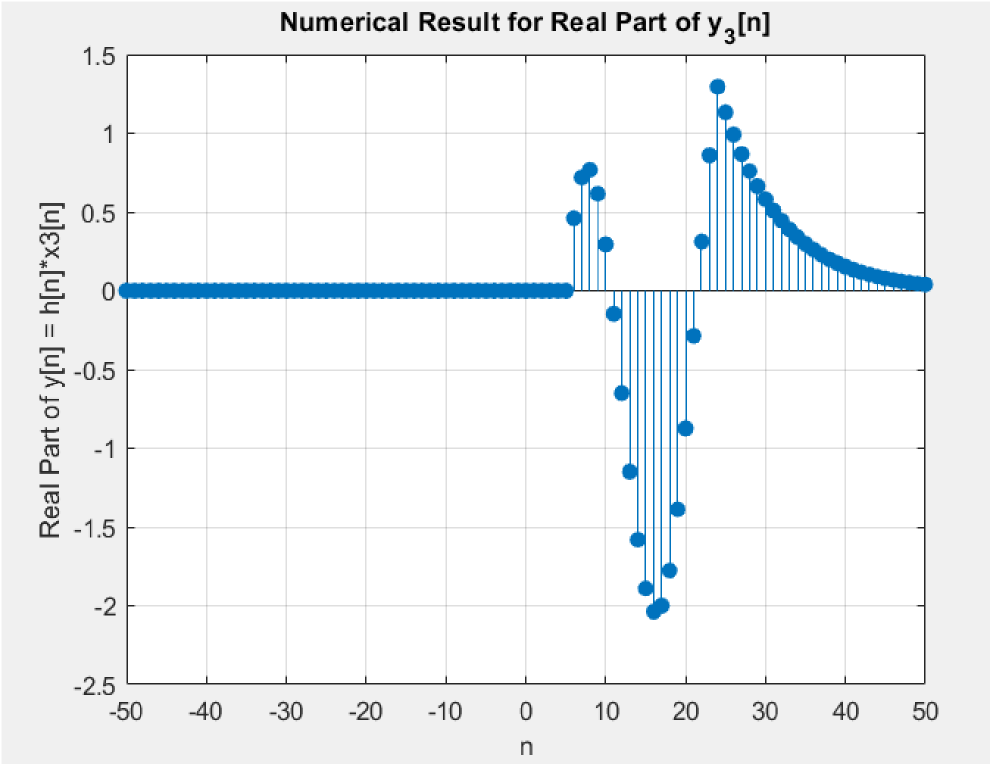

Figure 11: Plot of Numerical Result for Real Part of y3[n]

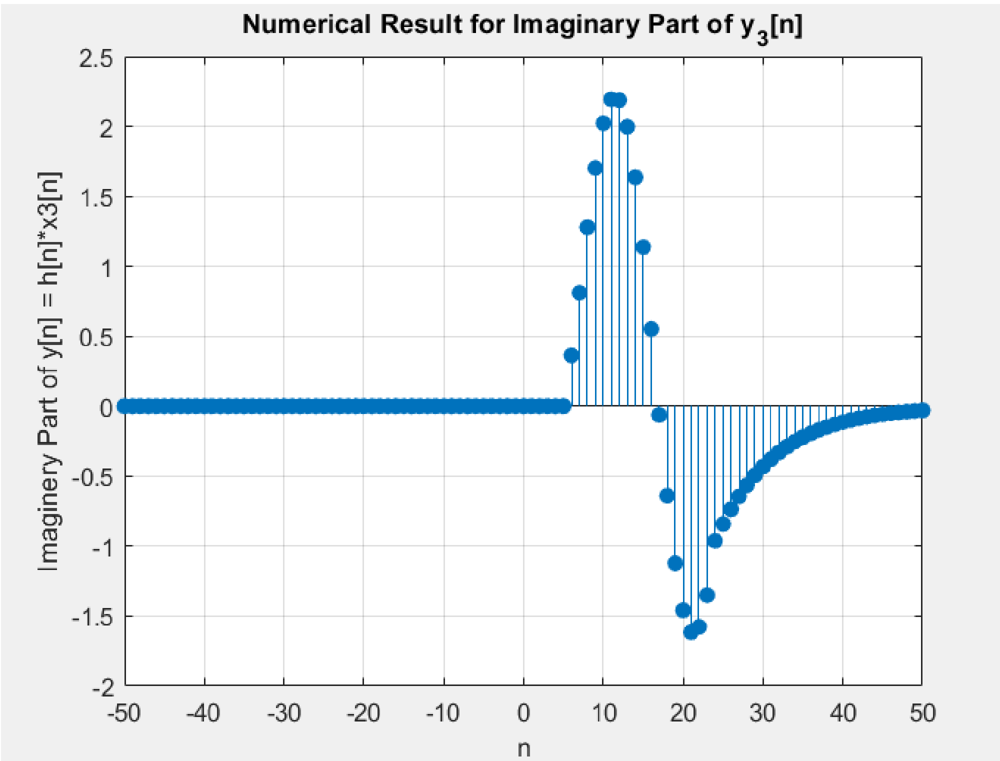

Figure 12: Plot of Numerical Result for Imaginary Part of y3[n]

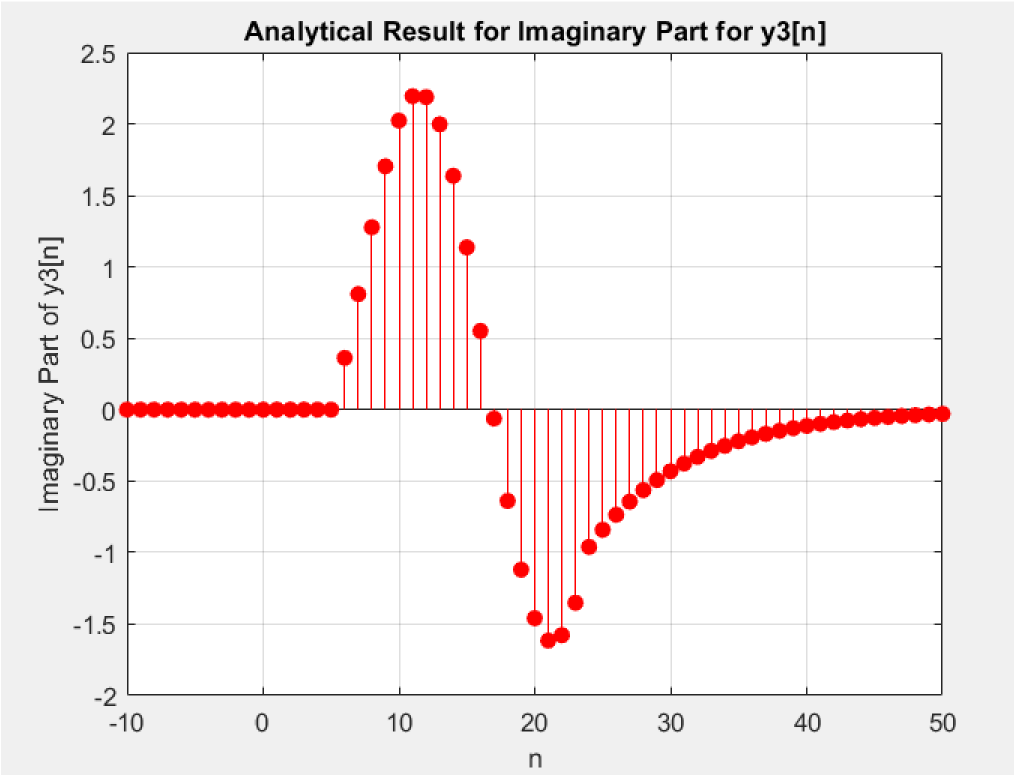

Figure 13: Plot of Analytical Result for Imaginary Part of y3[n]

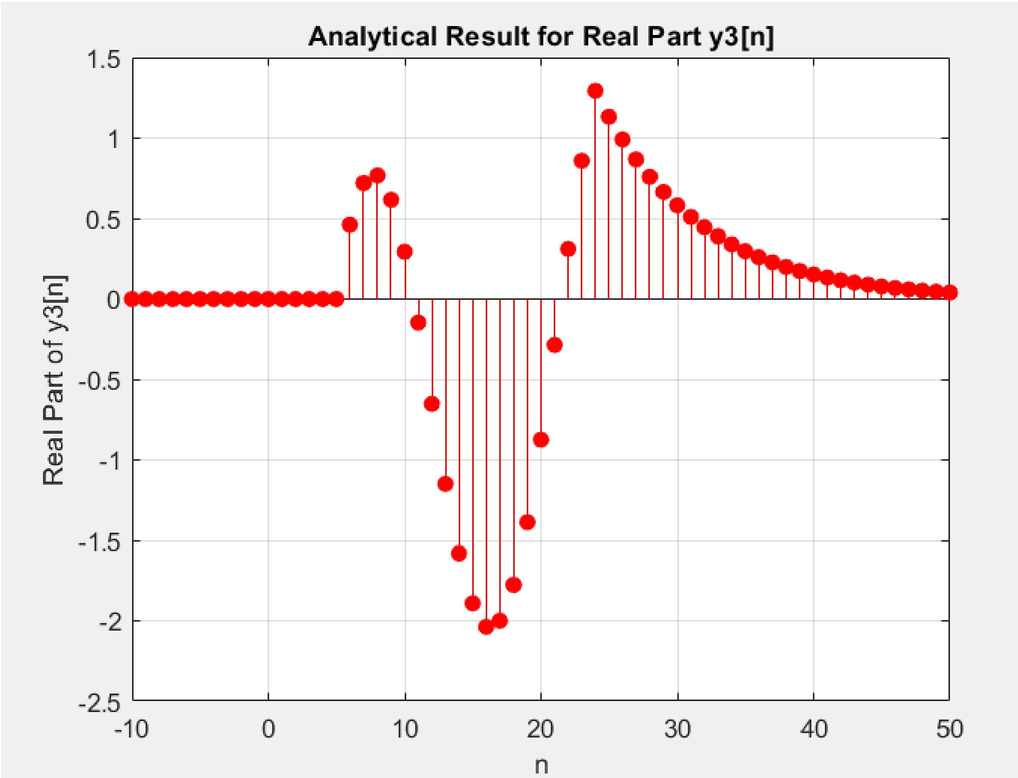

Figure 14: Plot of Analytical Result for Real Part of y3[n]

Appendix E: Figures of Question 1.d

```matlab
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);
x4 = zeros(size(r));
x4((r <= 20) & (r >= 2)) = -3*sin((2:20).*1/3);
y4 = zeros(size(r));
for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x4(k+(range1/2)+1);
    y4 = y4 + a;
end

% Plot Numerical Result
figure;
stem(-10:50,y4(41:101),'filled');
xlabel('n');
ylabel('y[n] = h[n]*x4[n]');
title('Numerical Result of Y_4[n]');
grid on;

range2 = -10:100;
y3_2 = zeros(size(range2));
j = sqrt(-1);

y3_2((range2 >= 6) & (range2 <= 24)) = (exp(j/3).^range2((range2 >= 6) & (range2 <= 24))) .* ...
    (((7/8) * exp(-j/3))^4 - ((7/8) * exp(-j/3)).^(range2((range2 >= 6) & (range2 <= 24)) - 1)) ...
    / (1 - (7/8) * exp(-j/3));

y3_2((range2 >= 24)) = (exp(j/3).^range2((range2 >= 24))) .* ...
    (((7/8) * exp(-j/3)).^(range2((range2 >= 24)) - 20) - ((7/8) * exp(-j/3)).^(range2((range2 >= 24)) - 1)) ...
    / (1 - (7/8) * exp(-j/3));
% Plot -3 * Im{y3[n]}
figure;
stem((-10:50), -3 * imag(y3_2(1:61)), 'filled', '.r');  % Plot -3 times the imaginary part of y3[n]
xlabel('n');
ylabel('Y_4[n]= -3 * Im{y_3[n]}');
title('Analytical Result for Y_4[n]');
grid on;
```

Figure 15: MatLab Code of Question 1.d

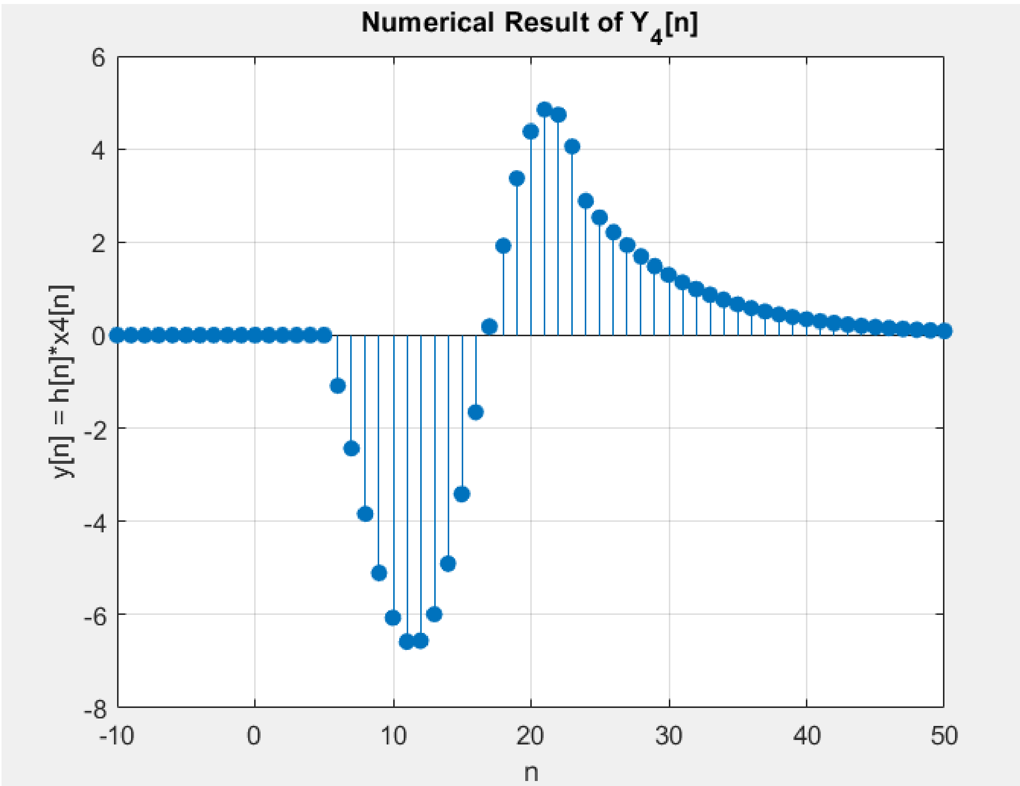

Figure 16: Plot of Numerical Result of y4[n]

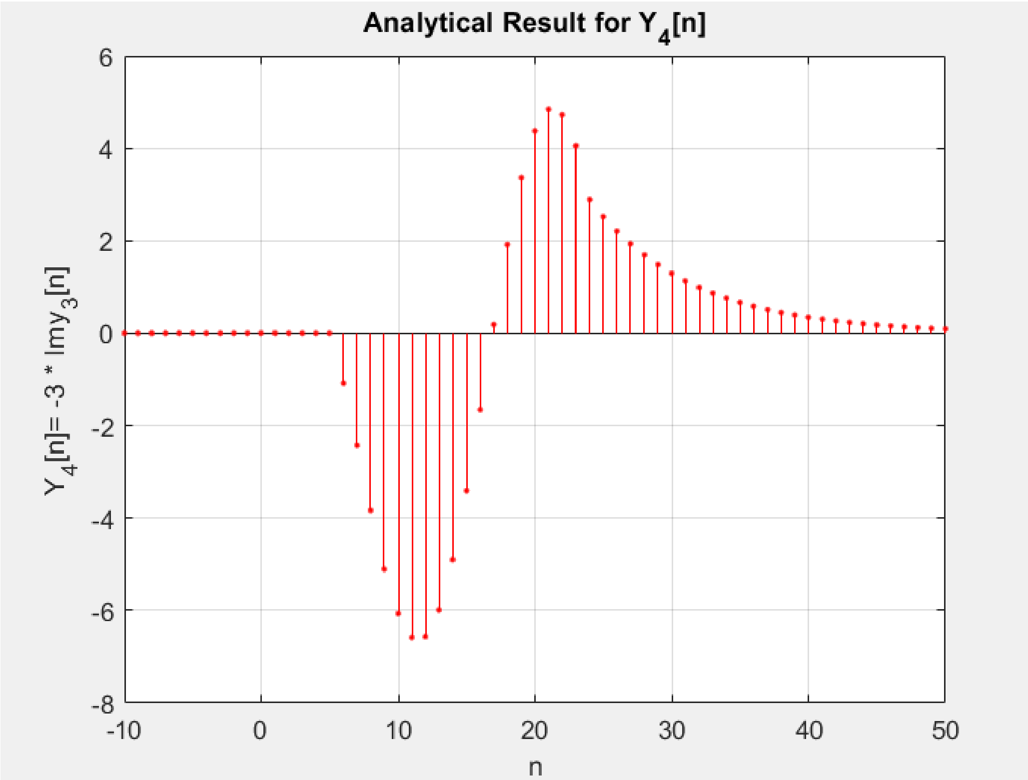

Figure 17: Plot of Analytical Result for y4[n]

Appendix F: Figures of Question 1.e

```matlab
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);
x5 = zeros(size(r));
x5((r <= 20) & (r >= 2)) = 2*cos((2:20).*1/3);
y5 = zeros(size(r));
for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x5(k+(range1/2)+1);
    y5 = y5 + a;
end
% Plot Numerical Result
figure;  % Open a new figure window
stem(-10:50,y5(41:101),'filled');
xlabel('n');
ylabel('y[n] = h[n]*x5[n]');
title('Numerical Result of Y_5[n]');
grid on;

range2 = -10:100;
y3_2 = zeros(size(range2));
j = sqrt(-1);

ind1 = (range2 >= 6) & (range2 <= 24);
y3_2(ind1) = (exp(j/3).^range2(ind1)) .* ...
    (((7/8) * exp(-j/3)).^4 - ((7/8) * exp(-j/3)).^(range2(ind1) - 1)) ...
    / (1 - (7/8) * exp(-j/3));

ind2 = (range2 > 24);
y3_2(ind2) = (exp(j/3).^range2(ind2)) .* ...
    (((7/8) * exp(-j/3)).^(range2(ind2) - 20) - ((7/8) * exp(-j/3)).^(range2(ind2) - 1)) ...
    / (1 - (7/8) * exp(-j/3));
y3_re = 2 * real(y3_2);
figure;
stem((-10:50), y3_re(1:61), 'filled', '.r');  % 2 * Re{y3[n]} sinyalini yeşil renkte çiz
xlabel('n');
ylabel('2 \cdot Re\{y3[n]\}');
title('Analytical Result for Y_5[n]');
grid on;
```

Figure 18: MatLab Code of Question 1.e

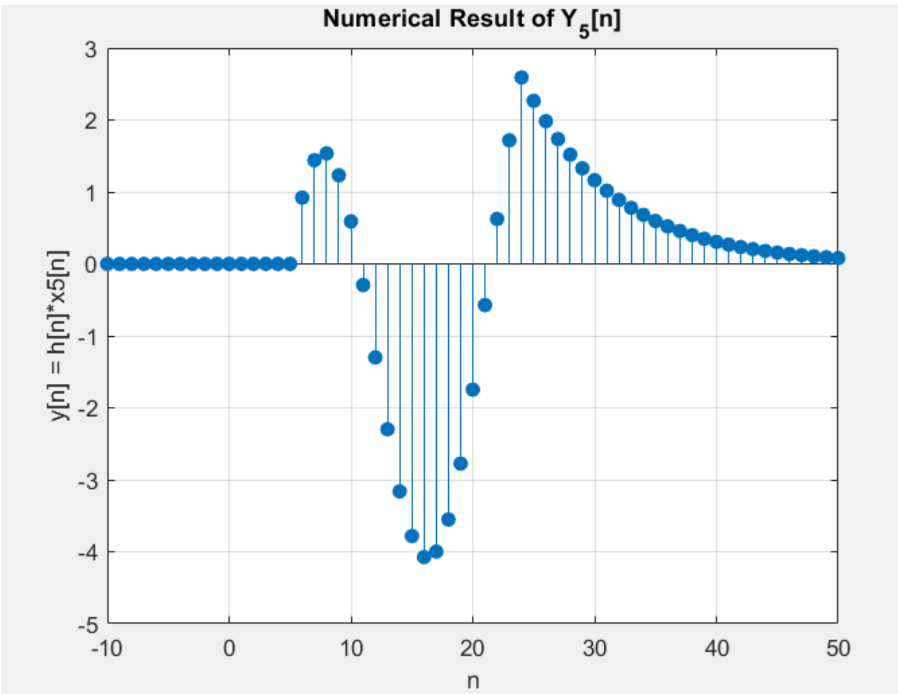

Figure 19: Plot of Numerical Result of y5[n]

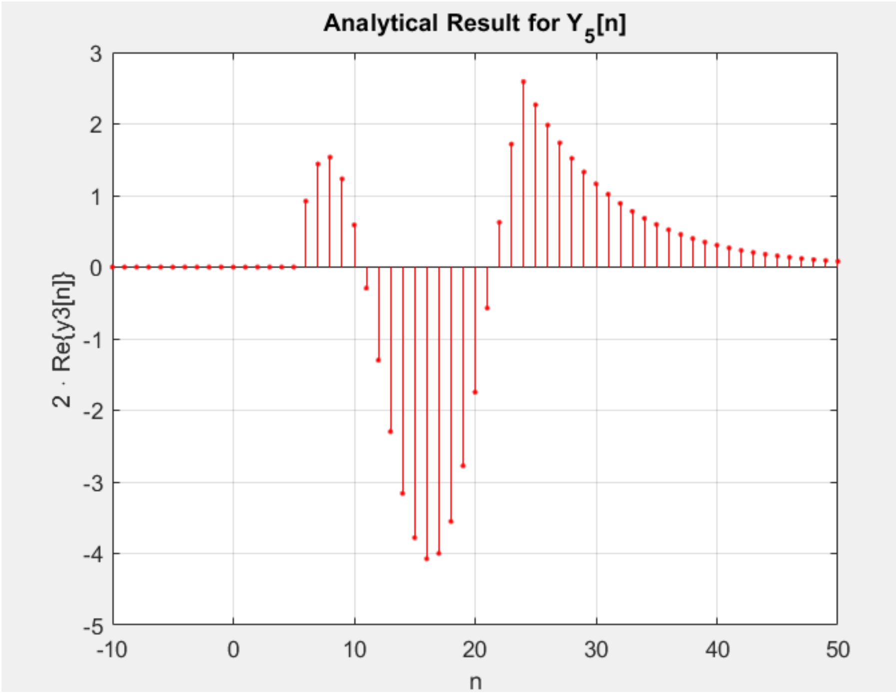

Figure 20: Plot of Analytical Result of y5[n]

Appendix G: Figures of Question 1.f

```
% Numerical Result
range1 = 100;
range2 = -range1:1:range1;
uh = zeros(size(range2));
uh(range2 >= 4) = 1;
impulse = (7/8).^range2 .* uh;
r = (-range1/2):1:(range1/2);

x1 = zeros(size(r));
x1((r <= 8) & (r >= 0)) = 3;

x2 = zeros(size(r));
x2((r <= 4) & (r >= 0)) = 3;
x2((r <= 8) & (r >= 5)) = -3;
x2((r <= 13) & (r >= 9)) = -6;

y6 = zeros(size(r));
x6=x1+2*1i*x2;

for k = -(range1/2):(range1/2)
    a = impulse(r-k+range1+1) .* x6(k+(range1/2)+1);
    y6 = y6 + a;
end

% Plot Numerical Result
figure;  % Open a new figure window
stem(-10:50,real(y6(41:101)),'filled');
xlabel('n');
ylabel('Real Part of y[n] = h[n]*x6[n]');
title('Numerical Result for Real Part of y_6[n]');
grid on;

figure;  % Open a new figure window
stem(-10:50,imag(y6(41:101)),'filled');
xlabel('n');
ylabel('Imaginary Part of y[n] = h[n]*x6[n]');
title('Numerical Result for Imaginary Part of y_6[n]');
grid on;
```

Figure 21: MatLab Code of Question 1.f

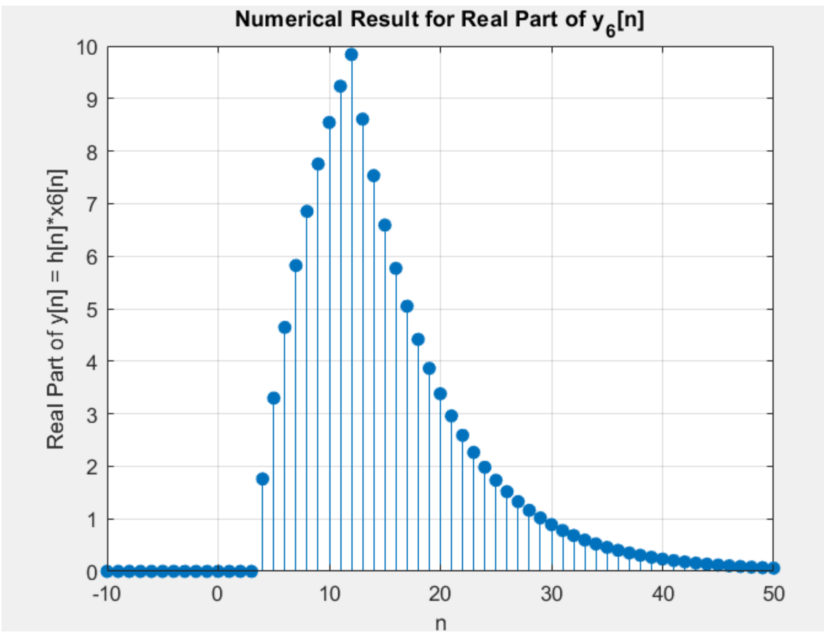

Figure 22: Plot of Numerical Result for the Real Part of y6[n]

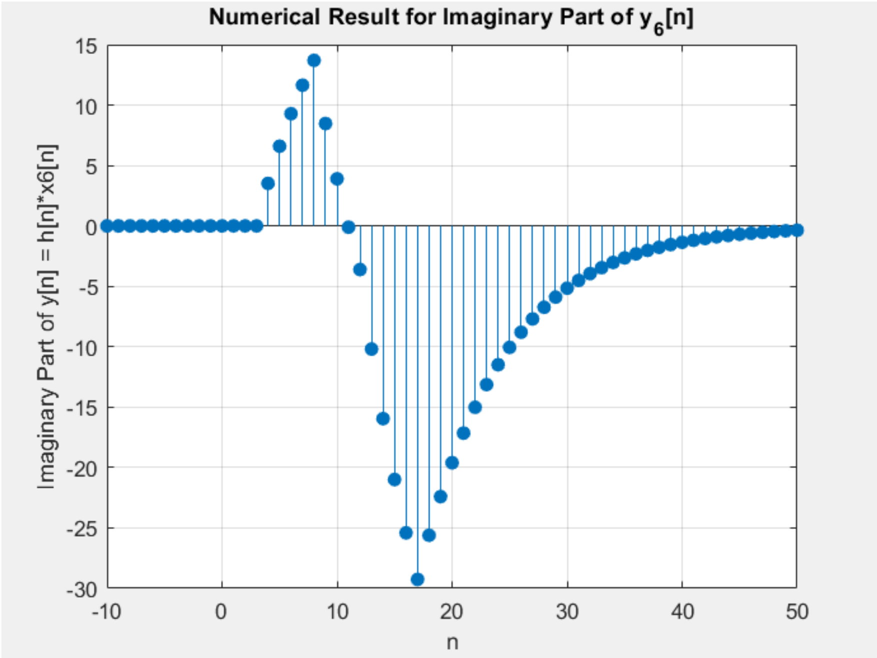

Figure 23: Plot of Numerical Result for the Imaginary Part of y6[n]

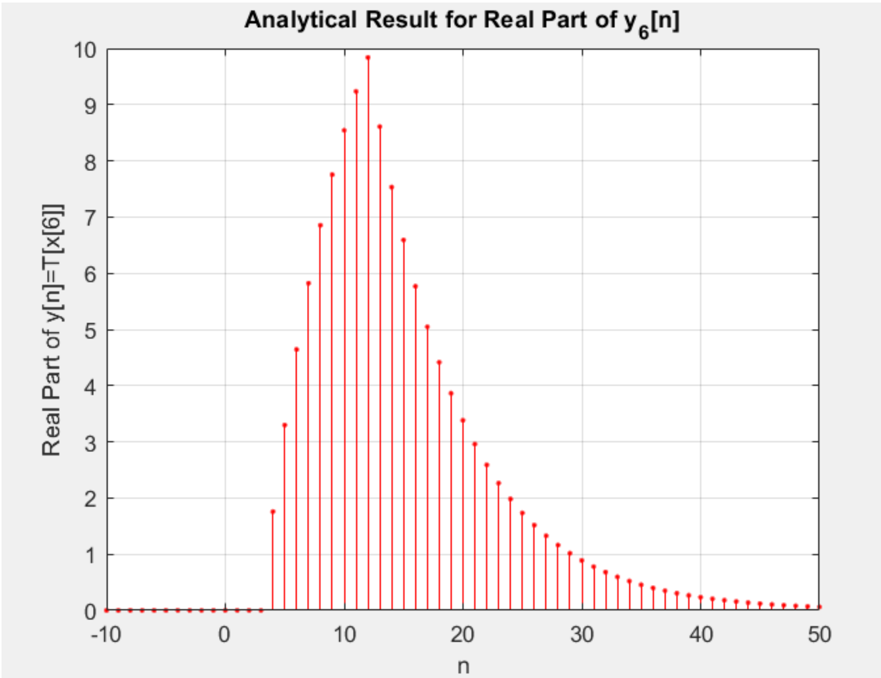

Figure 24: Plot of Analytical Result for the Real Part of y6[n]

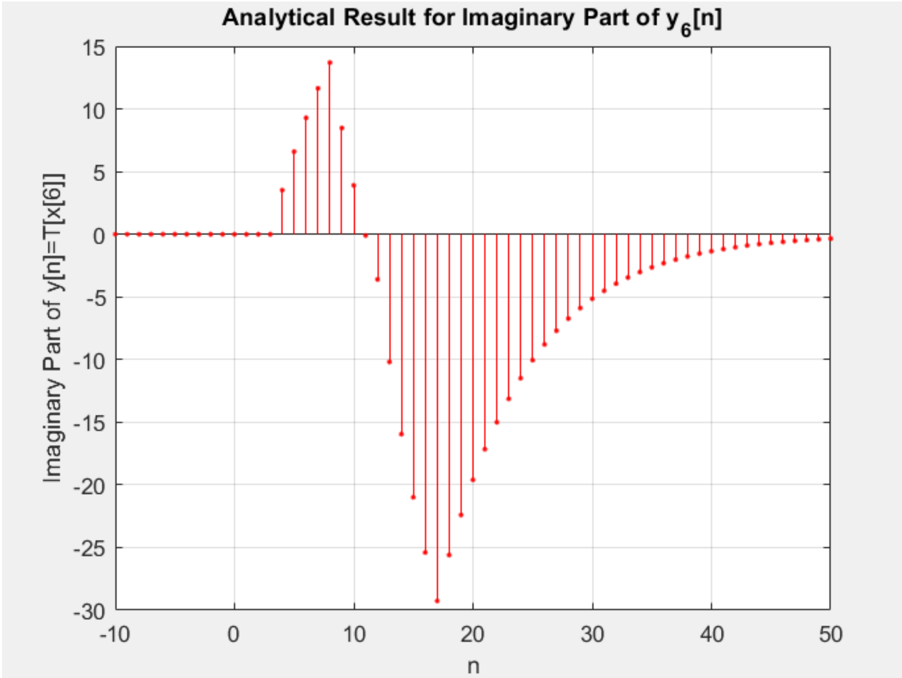

Figure 25: Plot of Analytical Result for the Imaginary Part of y6[n]