

```

% Problem 21
b = [1, 0, -1];
a = [1, 0.9, 0.6, 0.05];

figure(1);
subplot(3, 2, 1);
zplane(b, a);
title('Zero-Pole Plot of H(z)');

subplot(3, 2, 2);
[r, p] = residuez(b, a);
r_amp = abs(r); r_angle = angle(r);
p_amp = abs(p); p_angle = angle(p);
% r =
% 1.5880 - 0.1409i
% 1.5880 + 0.1409i
% -2.1760 + 0.0000i
% r_amp =
% 1.5942
% 1.5942
% 2.1760
% r_angle =
% -0.0885
% 0.0885
% 3.1416
%
% p =
% -0.4022 + 0.6011i
% -0.4022 - 0.6011i
% -0.0956 + 0.0000i
% p_amp =
% 0.7233
% 0.7233
% 0.0956
% p_angle =
% 2.1605
% -2.1605
% 3.1416

n = 0:29;
h = @(n) ...
    -2.176*(-0.0956).^n + ...
    (2*(1.5942)*(0.7233).^n).*cos(2.1605*n - 0.0885); % n > 0

stem(n, h(n));
title('Impulse response found using residuez and analytic methods');

subplot(3, 2, 3);
h_imp = impz(b, a, 30).';
stem(n, h_imp);
title('Impuse response found using impz');

subplot(3, 2, 4);
h_fil = filter(b, a, [1 zeros(1, 29)]);
stem(n, h_fil);
title('Impulse repsonse found using filter');

subplot(3, 2, 5);
stem(n, h(n) - h_imp);
title('Difference from analytic using impz');

subplot(3, 2, 6);
stem(n, h(n) - h_fil);
title('Difference from analytic using filter');

```

Problem 23

```
w0 = pi/3;

N = 14;
n = 0:N-1;
b = [1, 0];
a = @(r, w) [1, -2*r*cos(w), (r^2)];

figure(1);

r = 0.8;
subplot(3, 2, 1);
zplane(b, a(r, w0));
title(['zplane <-> r = ' num2str(r)]);

subplot(3, 2, 2);
stem(n, impz(b, a(r, w0), N));
title(['h[n] <-> r = ' num2str(r)]);

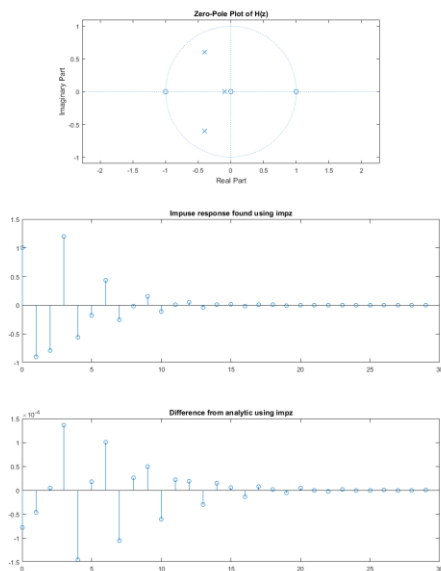
r = 1;
subplot(3, 2, 3);
zplane(b, a(r, w0));
title(['zplane <-> r = ' num2str(r)]);

subplot(3, 2, 4);
stem(n, impz(b, a(r, w0), N));
title(['h[n] <-> r = ' num2str(r)]);

r = 1.25;
subplot(3, 2, 5);
zplane(b, a(r, w0));
title(['zplane <-> r = ' num2str(r)]);

subplot(3, 2, 6);
stem(n, impz(b, a(r, w0), N));
title(['h[n] <-> r = ' num2str(r)]);
```

Problem 21



Problem 27

```
N = 100;
n = 0:N-1;
del = [1, zeros(1, N-1)];

b = 1;
a = [1, 0, -0.8];

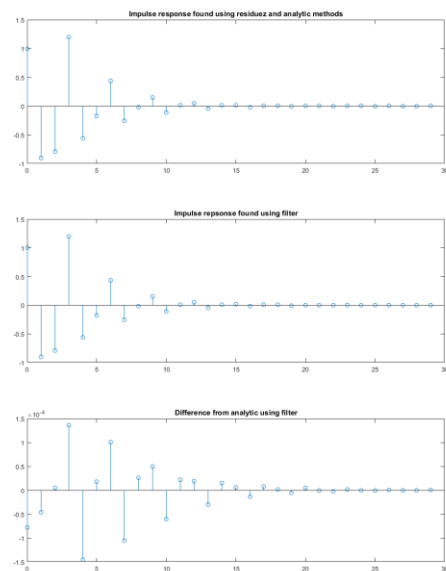
y1 = 0.8.^(n/2);
for i = 2:2:N
    y1(i) = 0;
end

y2 = filter(b, a, del);

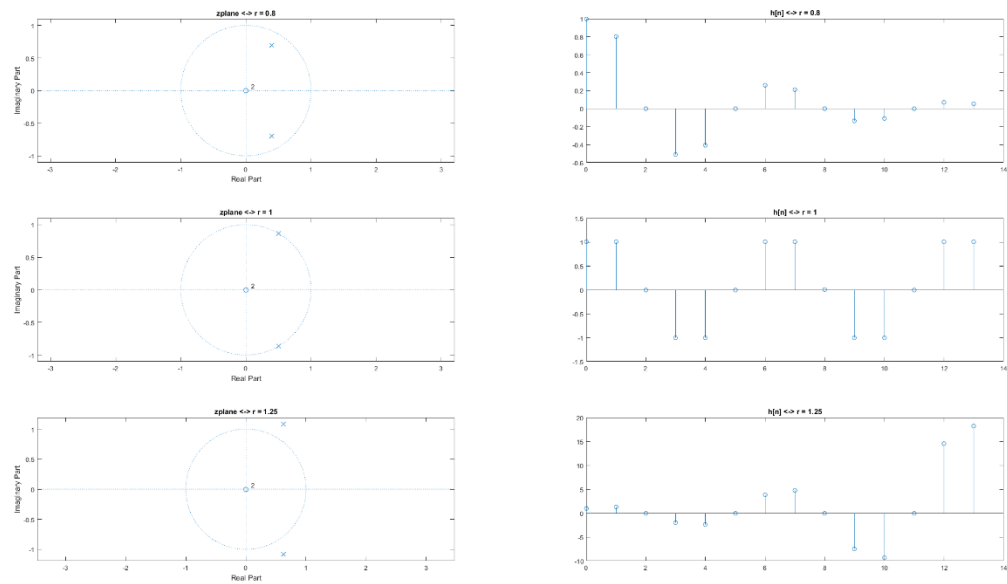
figure(1);
subplot(3, 1, 1);
stem(n, y1);
title('Piecewise value');

subplot(3, 1, 2);
stem(n, y2);
title('Inverse z-transform');

subplot(3, 1, 3);
stem(n, y2 - y1);
title('Error');
```



Problem 23



Problem 27

