```
%Number 2c)

% Define the numerator and denominator coefficients of H(z), H1(z), and
Hap(z)
% H(z) = (1 + 0.2z^-1)(1 - 9z^-2) / (1 + 0.81z^-2)
num_H = conv([1, 0.2], [1, 0, -9]); % Numerator of H(z)
den_H = [1, 0, 0.81]; % Denominator of H(z)

% H1(z) = (1 + 0.2z^-1)(1 - (1/9)z^-2) / (1 + 0.81z^-2)
num_H1 = conv([1, 0.2], [1, 0, -1/9]); % Numerator of H1(z)
den_H1 = [1, 0, 0.81]; % Denominator of H1(z)

% Hap(z) = (1 - 9z^-2) / (1 - (1/9)z^-2)
num_Hap = [1, 0, -9]; % Numerator of Hap(z)
den_Hap = [1, 0, -1/9]; % Denominator of Hap(z)

% Frequency range
w = linspace(0, pi, 1000);

% Compute frequency responses
[H_freq, w_H] = freqz(num_H, den_H, w);
[H1_freq, w_H1] = freqz(num_H1, den_H1, w);
[Hap_freq, w_Hap] = freqz(num_Hap, den_Hap, w);

% Magnitude and phase responses
H_mag = abs(H_freq);
H_phase = angle(H_freq);

H1_mag = abs(H1_freq);
H1_phase = angle(H1_freq);

Hap_mag = abs(Hap_freq);
Hap_phase = angle(Hap_freq);

% Plotting
figure;

% Magnitude responses
subplot(2, 1, 1);
plot(w, H_mag, 'b', 'LineWidth', 1.5, 'DisplayName', '|H(z)|');
hold on;
plot(w, H1_mag, 'r', 'LineWidth', 1.5, 'DisplayName', '|H1(z)|');
plot(w, Hap_mag, 'g', 'LineWidth', 1.5, 'DisplayName', '|Hap(z)|');
title('Magnitude Response');
xlabel('Frequency (rad/sample)');
ylabel('Magnitude');
legend;
grid on;

% Phase responses
```

```
subplot(2, 1, 2);
plot(w, H_phase, 'b', 'LineWidth', 1.5, 'DisplayName', '∠H(z)');
hold on;
plot(w, H1_phase, 'r', 'LineWidth', 1.5, 'DisplayName', '∠H1(z)');
plot(w, Hap_phase, 'g', 'LineWidth', 1.5, 'DisplayName', '∠Hap(z)');
title('Phase Response');
xlabel('Frequency (rad/sample)');
ylabel('Phase (rad)');
legend;
grid on;

hold off;
```