% **Tune-Up #6 on October 19, 2021**

% Homework problem 6.1(a) parts 1 and 2.

% For the first-order unnormalized averaging filter (lowpass filter)

% y[n] = x[n] + x[n-1] for n >= 0

% and the initial condition x[-1] = 0 to satisfy LTI properties,

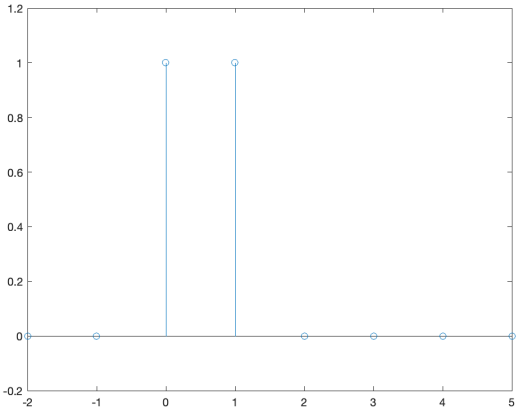
% determine the formulas for, and plot in MATLAB, the

% (a) impulse response h[n]

% Input the discrete-time impulse d[n]

% Discrete-time impulse: d[n] = 1 when n = 0 and 0 otherwise.

% Let x[n] = d[n]. Output h[n] = d[n] + d[n-1].



% h[-2] = d[-2] + d[-3] = 0 + 0 = 0

% h[-1] = d[-1] + d[-2] = 0 + 0 = 0

% h[0] = d[0] + d[-1] = 1 + 0 = 1 etc.

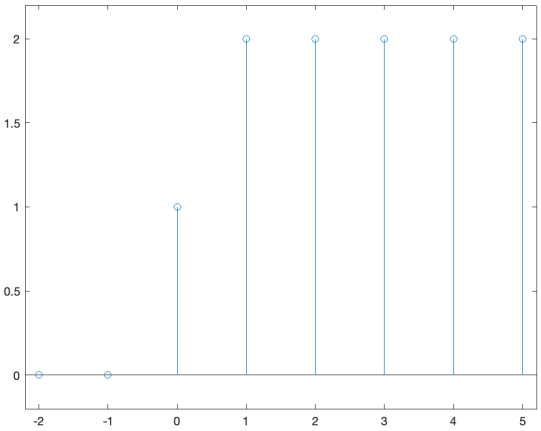
```
n = -2 : 5;
h = [ 0 0 1 1 0 0 0 0 ];
stem(n, h)
ylim( [ -0.2 1.2] );
```

% (b) step response ystep[n]

% Input the unit step function u[n]:

% u[n] = 1 for n >= 0 and 0 otherwise

% Let x[n] = u[n]. Output h[n] = u[n] + u[n-1].




```
n = -2 : 5;
unitstep = ( n >= 0 );
% Output:  0   0   1   1   1   1   1   1
unitstepdelayed = ( (n-1) >= 0 );
ystep = unitstep + unitstepdelayed;
stem(n, ystep);
ylim( [ -0.2 2.2 ] );
xlim( [ -2.2 5.2 ] );
```