Problem 1 (10 Points)  (a) Derive the impulse response for a continuous Linear Time Invariant (LTI) system whose step response is $s(t)$.
(b) Derive the impulse response for a discrete LTI system whose step response is $s[n]$.

Problem 2 (10 Points)  (a) Derive the eigenvalue and eigenfunctions of a given continuous LTI system which has $b(t)$ as its impulse response.
(b) Derive the eigenvalue and eigenfunctions of a given discrete LTI system which has $h[n]$ as its impulse response.

Problem 3 (10 Points)  (a) Given $x(t) = u(t) - u(t - 1)$ where $u(t)$ is the unit step function, obtain and plot $y(t) = x(t) \ast x(t)$.  
(b) Given $x[n] = u[n] - u[n - 1]$ where $u[n]$ is the unit step function, obtain and plot $y[n] = x[n] \ast x[n]$.