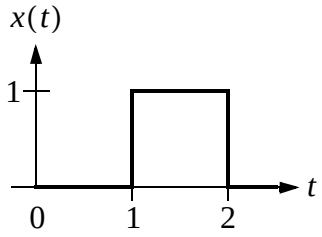
University of California at Berkeley
Department of Electrical Engineering and Computer Sciences
EECS 120, Professor J.M. Kahn
Midterm 1
Wednesday, October 9, 2002, 2:15-3:15 pm

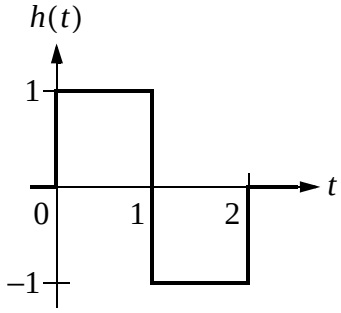
Name: _____

Note: indicate your answer clearly by circling it or drawing a box around it. When asked to make sketches of functions, label the horizontal and vertical axes of the plots.

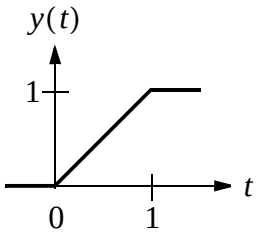
Problem	Points	Score
1	15	
2	30	
3	40	
4	15	
TOTAL:	100	

Problem 1 (15 pts.) Given the signals $x(t)$ and $h(t)$ shown, sketch $y(t) = x(t)*h(t)$.





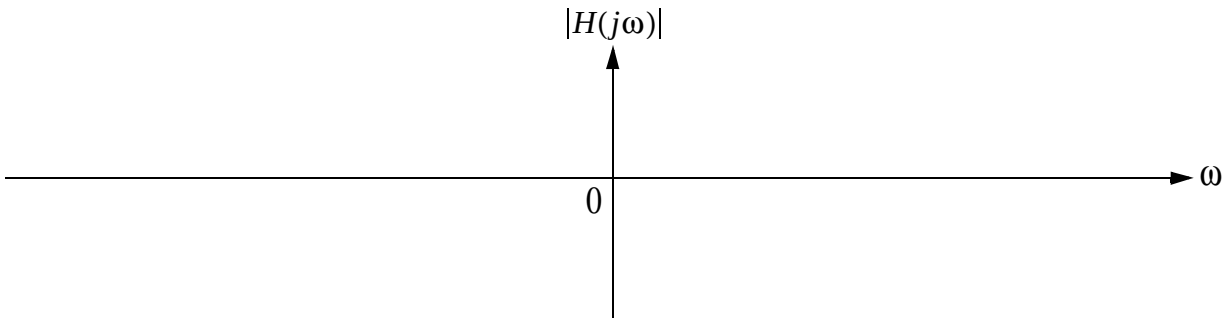
Problem 2 (30 pts.) Consider an LTI CT system. When the input is $x(t) = r(t) = t \cdot u(t)$, the output $y(t)$ is as shown.

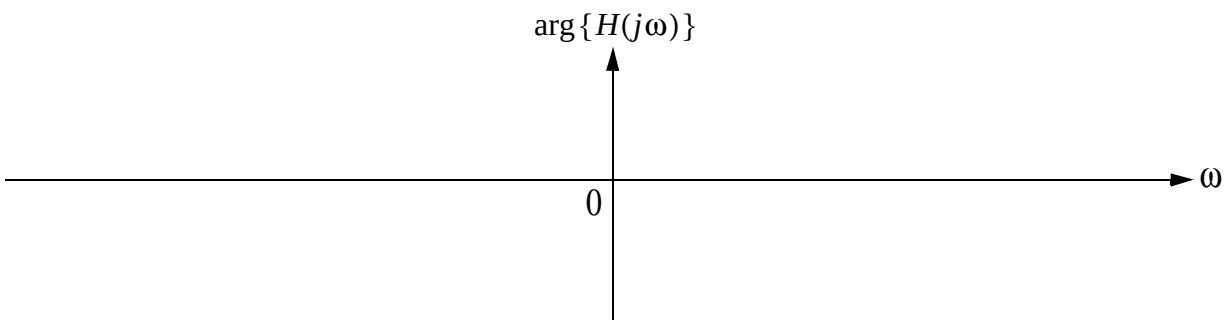


(a) (10 pts.) Find an expression for the system step response $s(t)$ and sketch $s(t)$.

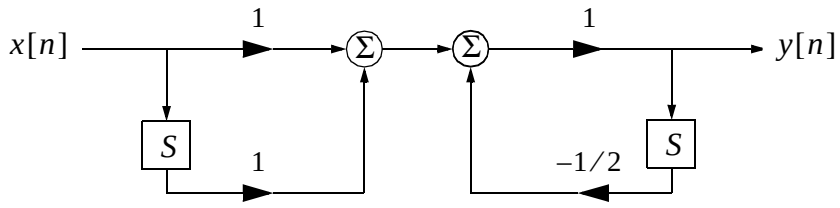
(b) (10 pts.) Find an expression for the system frequency response $H(j\omega)$.

(c) (10 pts.) Sketch the magnitude and phase of $H(j\omega)$. If you find that $H(j\omega)$ is periodic, you may plot only one period.





Problem 3 (40 pts). Consider the LTI DT system shown.



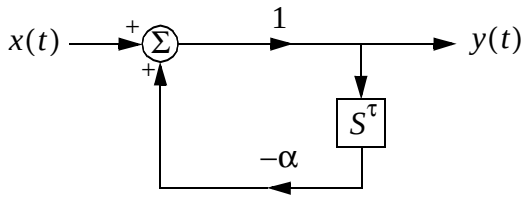
(a) (5 pts.) State the difference equation governing the system.

(b) (10 pts.) Find the system frequency response $H(e^{j\Omega})$.

(c) (5 pts.) The input is $x[n] = \cos\Omega_0 n$, $\forall n$. Find Ω_0, $0 \le \Omega_0 < 2\pi$, such that $y[n] = 0$, $\forall n$.

(d) (20 pts.) Find the system step response $s[n]$.

Problem 4 (15 pts.) Consider the LTI CT system shown.



(a) (5 pts.) Find an expression for the impulse response $h(t)$.

(b) (10 pts.) For what values of α is the system stable?