

University ☺ of P ☺ r t l a n d
Sch ☺ o o l ☺ of E n g i n e e r i n g

EE 262-Signals & Systems-3 cr. hrs.
Spring 2012

Midterm Exam # 1

(Prepared by Professor A. S. Inan)

(Friday, February 17, 2012)

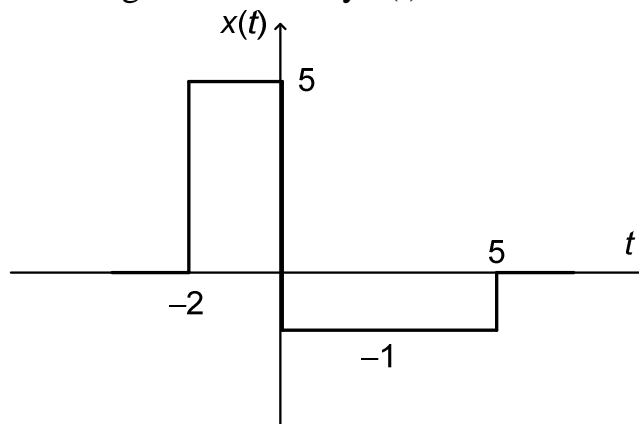
(Closed Book Exam, One formula sheet allowed.)

(Total Time: 55 mins.)

Name: _____ ☺

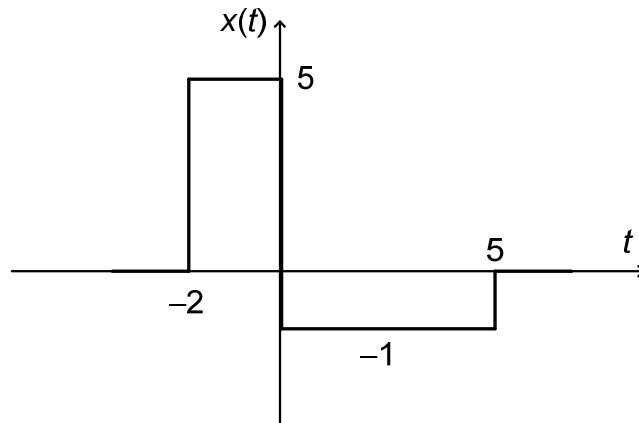
Signature: _____ ☺

- (1) (15 mins., Total: 25 points) **A continuous-time signal.** Consider a continuous-time signal denoted by $x(t)$ as shown in the figure below.

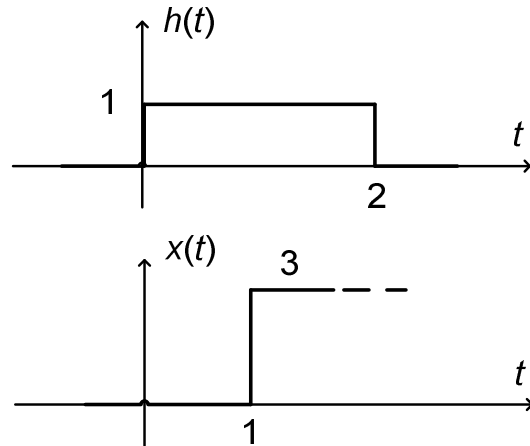


- (a) (12.5 points) Sketch the even and odd parts of $x(t)$. Provide all the pertinent values on your sketch.

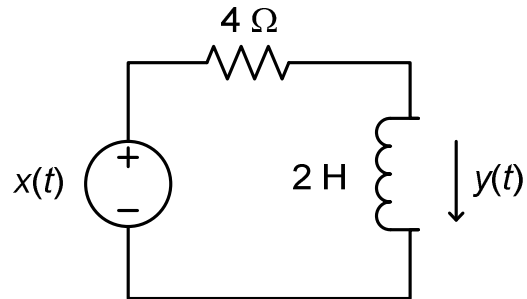
(b)(12.5 points) Find the complete mathematical expression for the function $y(t)=dx(t)/dt$ and sketch $y(t)$ versus t . Provide all the pertinent values on your sketch.



- (2) (15 mins., 25 points) **LTI system.** The impulse response $h(t)$ of an LTI system is given as sketched below. Find the complete mathematical expression and sketch the output response $y(t)$ of this system due to the input signal $x(t)$.



(3)(10 mins., 25 points) **First-order electric circuit.** Find and sketch the unit-step and impulse responses of the first-order electric circuit shown.



(4)(15 mins., Total: 25 points) **Properties of a discrete-time system.** The input $x[n]$ and the output $y[n]$ relationship of a discrete-time system is given by $y[n] = \sum_{k=-2}^2 x[n-k]$.

(a) (3 points) Is this system memory-less? (Provide a clearly stated justification for your answer.)

(b) (3 points) Is this system causal? (Clear justification required!)

(c) (3 points) Is this system BIBO stable? (Justification required!)

(d) (3 points) Is this system invertible? (Justification required!)

(e) (4 points) Is this system linear? (Justification required!)

(f) (4 points) Is this system time invariant? (Justification required!)