EEE2035F: Signals and Systems I

Class Test 1

11 March 2013

Name:

Student number:

Information

- The test is closed-book.
- This test has *four* questions, totaling 20 marks.
- Answer *all* the questions.
- You have 45 minutes.

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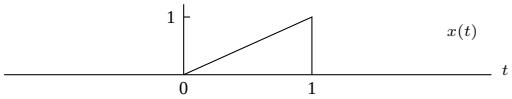
1. (5 marks) Suppose $x(t)$ is as shown below:



Sketch the following signals:

(a) $y_1(t) = x(2 - t)$

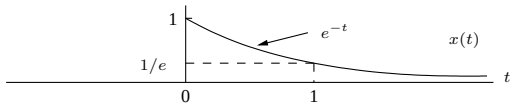
(b) $y_2(t) = x(t - 2)$

(c) $y_3(t) = x(t/2 - 1)$

(d) $y_4(t) = x(t)\delta(t - 1/2)$

(e) $y_5(t) = -2x(-t)$.

2. (5 marks) The signal $x(t) = e^{-t}u(t)$ is shown below:



Find and sketch the following:

(a) $y(t) = \frac{d}{dt}x(t)$ (the generalised derivative)

(b) $z(t) = \int_{-\infty}^{t} x(\lambda)d\lambda$.

In each case write down a mathematical expression for your answer.

3. (5 marks) The input $x(t)$ and output $y(t)$ from a system satisfies the relationship

$$y(t) = x(2t).$$

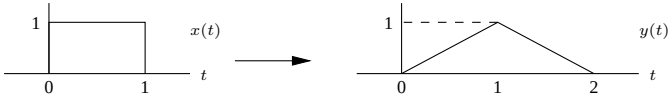
The signal $u(t)$ is the standard unit step.

(a) Find and sketch the output $y_1(t)$ when the input is $x_1(t) = u(t)$

(b) Find and sketch the output $y_2(t)$ when the input is $x_2(t) = u(t-1)$

(c) Based on your answers, does the system appear to be time invariant? Why?

4. (5 marks) For a given linear and time invariant system it is known that the input $x(t)$ and output $y(t)$ below is a valid input-output pair:



Use this information to find the response to the input