EEE2035F: Signals and Systems I

Class Test 1

19 March 2012

Name:

Student number:

Information

- The test is closed-book.

- This test has *four* questions, totalling 25 marks.

- Answer *all* the questions.

- You have 45 minutes.

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1. (10 marks) Suppose $x(t) = e^{-t}u(t)$. Sketch the following:

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

   (b) $y_2(t) = x(-t+1)$

   (c) $y_3(t) = x(-t+1)u(t)$

   (d) $y_4(\lambda) = x(t-\lambda)$
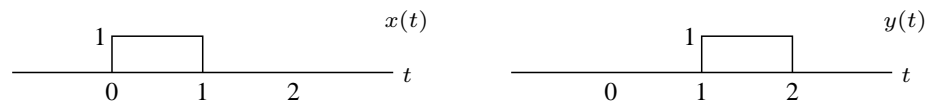
   (e) $y_5(t) = x(t)\delta(t-1)$

   (f) $y_6(t) = \frac{d}{dt}x(t)$

2. (5 marks) Suppose the output $y(t)$ of a system is related to the input $x(t)$ via the relationship
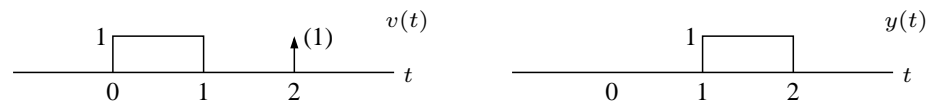
$$y(t) = x(t) + 1.$$

(a) Is the system linear?

(b) Is the system time invariant?

3. (5 marks) Suppose you're given the signals

$x(t)$

$y(t)$

(a) Use the method of your choice to find $w(t) = x(t) * y(t)$.

(b) Use the result from the previous question to find $f(t) = y(t) * v(t)$ for these signals:

$v(t)$

$y(t)$

4. (5 marks) A unit step input is applied to a LTI system, and results in the following response:

$$y(t) = \frac{1}{2}tu(t) - \frac{1}{20}(1 - e^{-10t})u(t).$$

(a) Find and plot $\frac{d}{dt}y(t)$.

(b) Use the derivative property of convolution to find the impulse response of the system.