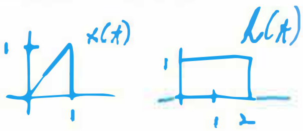
Name *Answers*

EE3032 – Dr. Durant – Quiz 5
Fall 2017, Week 5

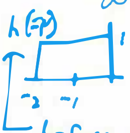
1. (2 points) Sketch the functions: $x(t) = r(t)\,(u(t) - u(t-1))$ [time-limited ramp] & $h(t) = u(t) - u(t-2)$.
2. (3 points) Write the convolution integral for $y(t) = x(t) * h(t)$; use either form (it does not matter which function you fold). Do not substitute the function definitions or perform any simplification.
3. (2 points) Using a graphical argument, state and explain
   a. The domain over which $y(t)$ must be 0 due to the inputs not overlapping.
   b. The domain over which $y(t)$ must be a non-0 constant due to $h(\cdot)$ fully overlapping $x(\cdot)$. Note: $h(\cdot)$ means $h(t)$ as transformed by your convolution integral; it may or may not be folded depending on your approach.
4. (3 points) Sketch the complete function $y(t)$. Be sure to sketch the transition between the two regions above correctly (e.g., derivative at transition points, whether it is a straight line, convex, concave, etc.). You could calculate the convolution integral in the transition range, but it is not necessary if you use other means to calculate the the area of the triangle in $x(\cdot)$ as more of its domain is included.

(1)



(2) $y(t) = \int_{-\infty}^{\infty} x(\tau)\, h(t-\tau)\, d\tau$

(3)



before shifting right by t

(a) $h(t-\tau)$ doesn't overlap $x(\tau)$ if $t<0$ or $t>3$

(b) $h(t-\tau)$ fully overlaps $x(\tau)$ if $1 \le t \le 2$

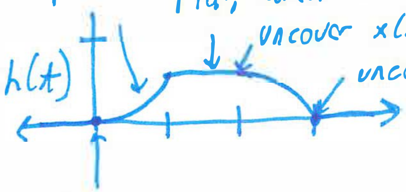
(4)

parabola $= \int (x(t)=t)$

Flat, area $= 1/2 =$ all of $x(t)$: $\int_{-\infty}^{\infty} x(t)\,dt = \frac{1}{2}$

uncover $x(t)$ @ $t=0$

uncover $x(t)$ @ $t=1$



start to cover $x(t)$ @ $t=0$ (0 height)