**ENGR 3323: Signals and Systems**

**Test 1 (6/21/22)**

**Time (**75 minutes): 11:00 to 12:15 **Name:**

**Note: Show all steps of your solution for full credit. A final answer is not enough.**

**10Q1)** Evaluate the integral

**10Q2)** Plot *x*(2*t*-3) where *x*(*t*) is shown in Fig. 1a below.

**10Q3)** Find and plot the derivative, d*x*/d*t*, of the signal *x*(*t*) shown in **Fig**. 1a below.

**10Q4)** A system described by (*D*2 - *D* - 6) *y*(*t*) = (*D*+1) *x*(*t*), is the system stable?

**10Q5)** A system described by *y*(*t*) = *t* *x*(*t* - 1). Is the system causal?

**14Q6)** The impulse response of a realizable system is , where *C*1 = 2 - *j*3 and λ1 = -2 + *j*10.

1. Find *C*2 and λ2
2. Express the impulse response in this format . Make sure to find the numerical values of the parameters *A*, *σ*, *ω*, and *θ*.

**16Q7)** Find the unit impulse response, *h*(*t*), for an LTIC system described by the following differential equations:

(*D*2 +8*D* + 16)*y*(*t*) = (*D* - 1)*x*(*t*)

**20Q8)** An LTIC system is specified by the impulse response *h*(*t*) shown below in **Fig**. 1b. Find the zero-state response for the input *x*(*t*) = 2*t* [*u*(*t*) - *u*(*t*-2)] shown below in **Fig**. 1a.

4

2

*x*(*t*) = 2*t* 0 ≤ *t* ≤ 2

*t*

2

Fig. 1a

Fig. 1b

2

*h*(*t*) = -(*t* -2) 0 ≤ *t* ≤ 2

*t*