ESE 305 – Quiz # 4 Question Sheet **Concentrate, Don't Make Careless Mistakes**

1. **(10 Pts Total)** An LTI system has impulse response $h(t) = t[u(t) - u(t-2)]$.

   (a) **(4 pt)** Determine the output of the system, $y_1(t)$, when the input is $x_1(t) = u(t) - u(t-10)$, i.e., find $y_1(t) = (x_1 * h)(t)$.

   (b) **(2 pt)** Determine the output of the system, $y_2(t)$, when the input is $x_2(t) = 10[u(t-100) - u(t-110)]$, i.e., find $y_2(t) = (x_2 * h)(t)$. [Hint: Use the result of part (a) and the linear and time-invariant properties of the system.]

   (c) **(2 pt)** Is the system causal (yes or no)? Explain.

   (d) **(2 pt)** Is the system BIBO stable (yes or no)? Explain.

2. **(5 Pts Total)** Consider a periodic signal

$$x(t) = 3 + \cos\left(\frac{2\pi}{3}t\right) + 5\sin\left(\frac{5\pi}{3}t\right).$$

   (a) **(1 pts)** Determine the period, T_0, of the signal.

   (b) **(4 pts)** Determine the Fourier series coefficients, a_k, of the signal. [Hint: Write cosine and sine as sums of complex exponentials.]

3. **(5 Pts Total)** Consider an LTI system with zero initial conditions and described by the difference equation:

$$y[n] - (1/3)y[n-1] = x[n].$$

   (a) **(4 pts)** Determine the impulse response of this system.

   (b) **(1 pts)** Is the system BIBO stable?