CPE 3500 Homework-2

1. For each of the following input-output relationships, determine whether the corresponding system is linear, time invariant or both. Show your work!
   a. $y(t) = tx(t-2)$
   b. $y[n] = x[n+1] - x[n-2]$
   c. $y[n] = 2^n x[n]$

2. Determine if each of the systems given below is memoryless and causal.

   a. $y(t) = x(t-2) + x(2-t)$
   b. $y(t) = 5x(t/2)$
   c. $y[n] = x[n-3] - 2x[n-5]$
   d. $y[n] = nx[n]$

3. A continuous-time signal x(t) given below is sampled. Determine the minimum sampling frequency that this signal can be sampled so that the signal is perfectly recoverable. Find also the sampling interval.

$$x(t) = 10sin(2\pi t) + 5sin(8\pi t) + 3sin(12\pi t + \frac{\pi}{4})$$

4. A continuous-time analog signal having an amplitude range of 3.3V is digitized using a 10-bit ADC. Determine the number of quantization levels, resolution of the ADC, the quantization level that corresponds to 2.53V, the binary code for this conversion and the quantization error.