**ENGR 4323/5323: Digital and Analog Communication**

**HW 1\_Ch2**

**1)** Find the energy of the signal *x*(*t*) below.



**2)** Find the power of the two signals below



**3)** for the signal *g*(*t*) shown below, sketch the signals **a)** *g*(*t*-4) **b)** *g*(-*t*) **c)** *g*(2*t*-4) 

**4)** For the signal *g*(*t*) and *x*(*t*) shown below, find the component of the form *x*(*t*) contained in *g*(*t*). In other words, find the optimum value of c in the approximation *g*(*t*) ≈ c*x*(*t*) so that the error signal energy is minimum. What is the error signal energy?



**5)** Find the correlation coefficient *ρ* between the vector *v*1=[2 1 5] and vector *v*2=[3 2 4].

**6)** Find the correlation coefficient *ρ* between the signal *x*(*t*) and each of the four pulses *g*1(*t*), *g*2(*t*), *g*3(*t*), and *g*4(*t*) shown below. To provide maximum margin against the noise along the transmission path, which pair of pulses would you select for a binary communication?



**7)** **a)** For the two signals shown below, determine a set of orthonormal basis functions of dimension 2.

**b)** Determine the vector representation of both *g*(*t*) and *x*(*t*) using the orthonormal basis from part **(a).**



**8)** **(a)** Sketch signal *g*(*t*) = | *t* | and find the exponential Fourier series to represent *g*(*t*) over the interval (-π, π). **(b)** Verify the Parseval’s theorem by determine the sum of a special infinite series.