EECS 361
Homework #3

1. Section 2.6 Participation activities
   2.6.1: Energy or power signals?
   2.6.2: Energy or power or neither?
   2.6.3: Power and energy in sums of signals

2. Find the power and energy in $x(t) = 7\,\mathrm{rect}\left(\frac{t-5}{3}\right)$

3. Determine if each of the following singals is a power signal, an energy signal or neither

a. $x_1(t) = -u(t)$

b. $x_2(t) = -4(u(t+4)-u(t-4))$

c. $x_3(t) = -3\sin(10t-0.785)$

4. In BPSK modulation a "1" bit is transmitted as $A\cos(2\pi f_c t)$ for a bit time T_b and a "0" bit as $-A\cos(2\pi f_c t)$ for a bit time T_b . Assume A = 10μV and bit time of 1ms (a bit rate of 1000 bits/sec), find the energy used to transmit a bit, E_b. Assume f_c T_b is an integer, or $f_c * T_b$=k where k is an integer.

5. Find the power in $x_{RF}(t) = 10\cos(2\pi f_m t)\cos(2\pi f_c t)$. Hint: $\cos(\alpha)\cos(\beta) = \frac{1}{2}(\cos(\alpha+\beta)+\cos(\alpha-\beta))$

6. Section 3.1 Participation activities
   3.1.1: Properties of square function.
   3.1.2: Linear or not?
   3.1.5: Is the system time invariant?

7. Specify if the following systems are linear and or time invariant.

a. $y(t) = 4x(t) + 1$

b. $y(t) = x^2(t)$

c. $y(t) = \int_{t-2}^{t+2} x(\tau)\,d\tau$

d. $y(t) = 0.2x(t) + 0.1x(t-1)$

e. $y(t) = tx^2(t)$

8. Let $y(t) = x^3(t)$. For $x(t)=A\cos(2\pi f_m t+\theta)$ find y(t). What frequencies are present in y(t)?