

## PTRP ASSIGNMENT

1. Given the function  $f_X(x) = 4 \cos\left(\frac{\pi x}{2b}\right) \text{rect}\left(\frac{x}{2b}\right)$ . Find a value of  $b$  so that  $f_X(x)$  is a valid probability density.
2. An intercom system master station provides music to six hospital rooms. The probability that any one room will be switched on and draw power at any time is 0.4. When on, a room draws 0.5W.
  - a) Find and plot the density and distribution functions for the random variable “power delivered by the master station.”
  - b) If the master-station amplifier is overloaded when more than 2W is demanded, what is its probability of overload?

3. A random variable  $X$  is Gaussian with  $a_X=0$  and  $\sigma_X = 1$ , show that

$$\int_{-\infty}^{\infty} (x - a_X)^2 f_X(x) dx = \sigma_X^2$$

4. In a certain junior Olympics, javelin throw distances are approximated by a Gaussian distribution for which  $a_X=30\text{m}$  and  $\sigma_X = 5\text{m}$ . In qualifying round contestants must throw farther than 26m to qualify. In the main event the record throw is 42m.
  - a) What is the probability of being disqualified in the qualifying round?
  - b) In the main event what is the probability the record will be broken?
5. Find the characteristic function and first moment about the origin of exponential distribution.
6. For the Binomial density, show that  $\bar{X} = Np$  and  $\sigma_X^2 = Np(1 - p)$