ECE 581 Homework 8

Due Thursday 5 AM October 22, 2015, (10 hmwk points total) Show work.
Electronic Submission – Please submit via "Assignment" under Sakai

Problem 8-1 (5 points Total) Given the foliowing random process $X(t) = A + \cos(\omega t + \theta)$ where θ is a uniform random variable in the range $-\pi$ to π and A is a constant. Determine analytical expressions for the following:
(a) (2 point) The mean of $X(t)$. Sketch and completely label it.
(b) (3 points) The autocorrelation function of $X(t)$. Sketch and completely label it.
(c) (1 points The autocovariance function of $X(t)$. Sketch and completely label it.

Problem 8-2 (5 points Total) Consider the random process $X(t) = A\cos(\omega t + \theta)$ where A and ω are known and the random variable θ has the pdf $f(\theta) = \frac{1}{2\pi}$ for $0 \leq \theta \leq 2\pi$ and 0 otherwise.

(a) (2 points) Derive an analytical expression for the first-order probability density function, $f_X(x;t)$ of this random process and sketch and completely label it.
(b) (2 points) Derive the expected value, $E[X(t)]$ of this random process? Sketch and completely label it..
(c) (1 point) Derive the variance, $\mathrm{Var}[X(t)]$, of this random process. Sketch and completely label it.