Math 291B/CS295 Assignment IV Spring, 2011

READING: [FW] Ch. 3
EXERCISES: Hand in Problems 1 – 6 on Monday, May 2, 2011.

1. Prove Proposition 7 and Corollary 6 of Chapter 3.

2. Prove Propositions 9 and 10 (on Gaussian distribution) of Chapter 3.

3. Prove Propositions 11 and 12 along with Corollary 7 (on Poisson distribution) of Chapter 3.

4. A random variable is *Rayleigh distributed* with real-valued parameter $\alpha > 0$ if it is distributed by the density function

$$p(x) = \begin{cases} \dfrac{x}{\alpha^2} e^{-(x/\alpha)^2/2} & (x \geq 0) \\ 0 & (x < 0) \end{cases}.$$

Determine $P(X \leq z)$, E[X] and Var[X] for this density function.

5. A random variable is *uniformly distributed in the interval* $(a,b)$ *if its density function is given by*

$$p(x) = \begin{cases} \dfrac{1}{b-a} & (a < x < b) \\ 0 & (otherwise) \end{cases}.$$

Determine $P(X \leq z)$, E[X] and Var[X] for this density function.

6. A random variable is *exponentially distributed* with real-valued parameter $\lambda > 0$ if its density function is given by

$$p(x) = \begin{cases} \lambda e^{-\lambda x} & (x \geq 0) \\ 0 & (x < 0) \end{cases}.$$

Determine $P(X \leq z)$, E[X] and Var[X] for this density function.

7. A random variable has a *binomial distribution* with real-valued parameter $p$, $0 < p < 1$, if its density function is given by

$$p(x) = \sum_{k=0}^{n} \binom{n}{k} p^k (1-p)^{n-k} \delta(x-k), \qquad \binom{n}{k} = \frac{n!}{k!(n-k)!}.$$

where $\delta(z)$ is the Dirac delta function. Determine $P(X \leq z)$, E[X] and Var[X] for $p(x)$.

8. (to be added)