CSE 505 Problem Set 5

Date: Friday, November 7th, 2003
Due date: Monday, November 17th, 2003

- **Problem 1**

The number of "leads" (contacts) available to a salesman on any given day is a Poisson random variable with probability mass function

$$p_k(k_0) = \frac{\mu^{k_0} e^{-\mu}}{k_0!}, \quad k_0 = 0, 1, 2, \ldots$$

The probability that any particular lead will result in a sale is 0.5. If your answers contain any series, they must be summed.

a. What is the probability that the salesman will make exactly one sale on any given day?

b. If we randomly select a sales receipt from his file, what is the probability that it represents a sale made on a day when he had a total of R leads?

c. What fraction of all his leads comes on days when he has exactly one sale?

d. What is the probability that he has no sales on a given day?

- **Problem 2**

Random variable x has the PDF $f_x(x_0)$, and we define the *Mellin transform* $f_x^M(s)$ to be

$$f_x^M(s) = E(x^s)$$

a. Determine $E(x)$ and σ_x^2 in terms of $f_x^M(s)$.

b. Let y be a random variable with

$$f_y(y_0) = K y_0 f_x(y_0)$$

i Determine K.

ii Determine $f_y^M(s)$ in terms of $f_x^M(s)$.

iii Evaluate $f_x^M(s)$ and $f_y^M(s)$ for

$$f_x(x_0) = u(x_0) - u(x_0 - 1)$$

where $u(x_0)$ is the unit step function. Use your results to determine $E(y)$ and σ_y.

c Let w and r be independent random variables with PDF's $f_w(w_0)$ and $f_r(r_0)$ and Mellin transforms $f_w^M(s)$ and $f_r^M(s)$. If we define $l = wr$, find $f_l^M(s)$ in terms of the Mellin transforms for w and r.