Show your work on all problems! If you use a computer to assist with numerical computations, turn in your source code as well.

1 **Devore Chapter 3, Problem 74**

2 **Devore Chapter 3, Problem 76**

3 **Devore Chapter 3, Problem 86**

4 **Devore Chapter 3, Problem 88**

5 **Computational Exercise (Extra Credit)**

The hypergeometric distribution

\[ h(x; n, M, N) = \binom{M}{x} \binom{N-M}{n-x} \binom{N}{n} \]  \hspace{1cm} (5.1)

can be approximated by a binomial distribution

\[ b(x; n, p) = \binom{n}{x} p^x (1-p)^{n-x} \]  \hspace{1cm} (5.2)

with \( p = M/N \), when \( M, N, \) and \( N - M \) are all large.

\[ a. \] Using a computer, plot the pmfs \( h(x; 10, 12, 20) \) and \( b(x; 10, .6) \) over the range of possible \( x \) values. (Recall that if you use matplotlib, the binomial coefficient can be imported from scipy with \texttt{from scipy import comb}.)

\[ b. \] Using a computer, plot the pmfs \( h(x; 10, 120, 200) \) and \( b(x; 10, .6) \) over the range of possible \( x \) values.

\[ c. \] Another large-number approximation is that the binomial distribution tends towards the Poisson distribution

\[ p(x; \mu) = \frac{e^{-\mu} \mu^x}{x!} . \]  \hspace{1cm} (5.3)

On the same set of axes, plot the Poisson pmf \( p(x; 3) \) and the binomial pmfs \( b(x; 12, .25) \) and \( b(x; 300, .01) \), for \( x \) between 0 and 12, inclusive. (If you use matplotlib, you can also import a factorial function from scipy with \texttt{from scipy import factorial}.)