HW8 Solutions
Math 3338-10853: Probability (Fall 2006), Dr. Jiwen He

93. a. $P(X \leq 8) = F(8; 5) = .932$
b. $P(X = 8) = F(8; 5) - F(7; 5) = .065$
c. $P(X \geq 9) = 1 - P(X \leq 8) = .068$
d. $P(5 \leq X \leq 8) = F(8; 5) - F(4; 5) = .492$
e. $P(5 < X < 8) = F(7; 5) - F(5; 5) = .867 - .616 = .251$

97. $p = \frac{1}{200}; n = 1000; \lambda = np = 5$
a. $P(5 \leq X \leq 8) = F(8; 5) - F(4; 5) = .492$
b. $P(X \geq 8) = 1 - P(X \leq 7) = 1 - .867 = .133$

99. a. $\lambda = 8$ when $t = 1$, so $P(X = 6) = F(6; 8) - F(5; 8) = .313 - .191 = .122$,
   $P(X \geq 6) = 1 - F(5; 8) = .809$, and $P(X \geq 10) = 1 - F(9; 8) = .283$
b. $t = 90$ min = 1.5 hours, so $\lambda = 12$; thus the expected number of arrivals is 12 and the SD
   $= \sqrt{12} = 3.464$
c. $t = 2.5$ hours implies that $\lambda = 20$; in this case, $P(X \geq 20) = 1 - F(19; 20) = .530$ and $P(X \leq 10) = F(10; 20) = .011$

104. $E(X) = \sum_{x=0}^{\infty} x \frac{e^{-\lambda} \lambda^x}{x!} = \sum_{x=1}^{\infty} x \frac{e^{-\lambda} \lambda^x}{x^2!} = \lambda \sum_{x=1}^{\infty} \frac{e^{-\lambda} \lambda^{x-1}}{(x-1)!} = \lambda \sum_{y=0}^{\infty} \frac{e^{-\lambda} \lambda^y}{y!} = \lambda$