STAT 400 SUMMER II 2001(PROFESSOR GREEN) SOLUTIONS TO ASSIGNED PROBLEMS DUE JULY 27

74.

(a) .191
(b) .526
(c) .084
(d) $E(X) = 8$ and $\sigma = \sqrt{8}$.

78.

(a) The expected value is 5 and the standard deviation is 2.17945.
(b) Using a Poisson approximation with $\lambda = 5$, the probability is approximately .032.
(c) .007.

80.

(a) .176
(b) .875
(c) 3.75

82.

(a) The expected number of diode failures is 2 and the standard deviation is $\sqrt{1.98} = 1.4071$.
(b) The distribution of the number of diodes that fails is binomial of type $(200, .01)$ and can be approximated by a Poisson distribution with $\lambda = 2$ This gives the probability of at least four failures as .143.
(c) We do not need the Poisson approximation for this part. The probability that a board will work is $.99^{200} = .134$, which seems an outrageously low level of reliability. The number of working boards out of five is then binomial of type $(5, .134)$. The probability that at least four will work is .0014. I don't think I want to do business with this company!

86.

(a),(b) The probability that y automobiles will arrive during the hour, ten of them with no violations, is the probability $e^{-10}\frac{10^y}{y!}$ that y automobiles will arrive, multiplied by the conditional probability that ten of them will be violation free. This conditional probability is $b(10; y, .5)$, and, with some cancellation, the product works out to be $e^{-10}\frac{5^y}{10!(y-10)!}$. The answer to part (a) is the special case $y = 10$.

(c) Summing over y from 10 to ∞, we make the substitution $y = 10+k$ and sum over k from 0 to ∞. This becomes

$$e^{-10}\frac{5^{10}}{10!}\sum_{k=0}^{\infty}\frac{5^k}{k!} = e^{-5}\frac{5^{10}}{10!},$$

which is the probability that a Poisson variable with $\lambda = 5$ will take the value 10. From the table, this is equal to .018.