Probability and Statistics Exam, 2

A software firm produces accounting programs. The probability that one of their programs is defective is 0.2. A chain store purchases 20 accounting programs from that firm.

a) **(1 point)** Find the probability that exactly 3 programs are defective.

b) **(1.5 point)** Find the probability that at least 80% of the programs are working properly.

c) **(1.5 points)** Let X denote the number of programs that are working properly. Find the probability distribution function of X. What type of distribution is it?

d) **(0.5 points)** What is the expected number of programs that are working properly?

et $X_1, X_2, ..., X_n$ be a random sample drawn from a *Poisson* distribution with parameter λ, unknown. (for $X \in \mathcal{P}(\lambda)$, the pdf is $p(x;\lambda) = \frac{\lambda^x}{x!}e^{-\lambda}$, $x = 0, 1, ...,$ $E(X) = V(X) = \lambda$).

a) **(1.5 points)** Find the maximum likelihood estimator, $\overline{\lambda}$, for λ.

b) **(0.5 points)** Is it an absolutely correct estimator? Explain.

c) **(1.5 points)** Find the efficiency of $\overline{\lambda}$, $e(\overline{\lambda})$.

d) **(1 point)** At the significance level $\alpha \in (0, 1)$, find a most powerful test for testing $H_0 : \lambda = 1$ against $H_1 : \lambda = 2$.