Quiz 3

Name:

For the following problems state the distribution used and the reason. {.bigger}

1. A widget manufacturer has promised a 0.1% defect rate. You test out 100 widgets and find one defect.
    a. Assuming the stated defect rate, what is the probability of finding one or more defect in 100 widgets?

    b. Assuming the stated defect rate, what is the expected number of widgets you would have to test to find a defective one?

    c. If you were to four batches of 100 widgets, what is the probability that none of the batches contains at least one defective widget?

Binomial(n, p):
pmf: $f(x) = \binom{n}{x} p^x (1-p)^{n-x}$
expectation: np
variance: $np(1-p)$

Poisson(λ):
pmf: $f(x) = \lambda^x e^{-\lambda}/x!$
expectation: λ
variance: λ

Geometric(p):
pmf: $f(x) = (1-p)^x p$
expectation: $\frac{1}{p} - 1$
variance: $\frac{1-p}{p^2}$

Negative Binomial(r, p):
pmf: $f(x) = \binom{x+r-1}{x} p^x (1-p)^r$
expectation: $\frac{pr}{1-p}$
variance: $\frac{pr}{(1-p)^2}$

Hypergeometric(N_1, N_2, n):
pmf: $f(x) = \frac{\binom{N_1}{x}\binom{N_2}{n-x}}{\binom{N_1+N_2}{n}}$
expecation: $nN_1/(N_1+N_2)$
variance: $n\frac{N_1}{N_1+N_2}\frac{N_2}{N_1+N_2}\frac{N_1+N_2-n}{N_1+N_2-1}$