The random variable X has the binomial distribution B(n, p).

- (a) Write down an expression for P(X = r) and hence show that the probability generating function of X is $(q + pt)^n$, where q = 1 p. [3]
- **(b)** Use the probability generating function of *X* to prove that E(X) = np and Var(X) = np(1-p).