

**18.443. Pset 1.**

(1) Prove that

$$\lim_{n \rightarrow \infty} \binom{n}{k} \left(\frac{\lambda}{n}\right)^k \left(1 - \frac{\lambda}{n}\right)^{n-k} = \frac{\lambda^k}{k!} e^{-\lambda}.$$

If you can't find easy proof, you can use Stirling's formula:

$$\lim_{n \rightarrow \infty} \left(\frac{n}{e}\right)^n \sqrt{2\pi n} / n! = 1.$$

(2) Compute  $EX$ ,  $EX^2$  and  $\text{Var}(X)$  for  $X \sim N(\alpha, \sigma^2)$ ,  $B(p)$ ,  $E(\alpha)$ ,  $\Pi(\lambda)$ ,  $U(0, \theta)$ .