NANYANG TECHNOLOGICAL UNIVERSITY

SPMS/DIVISION OF MATHEMATICAL SCIENCES

2016/17 Semester 1 MH2500 Probability and Introduction to Statistics Tutorial 12

For the tutorial on 10 November, let us discuss

- Ex. 5.4.4, 7, 10, 16, 26, 27.

Ex. 5.4.4. Suppose that the number of traffic accidents, N, in a given period of time is distributed as a Poisson random variable with $E(N) = 100$. Use the normal approximation to the Poisson to find Δ such that $P(100 - \Delta < N < 100 + \Delta) \approx 0.9$.

Ex. 5.4.7. Show that if $X_n \to c$ in probability and if g is a continuous function, then $g(X_n) \to g(c)$ in probability.

Ex. 5.4.10. A six-sided die is rolled 100 times. Using the normal approximation, find the probability that the face showing a six turns up between 15 and 20 times. Find the probability that the sum of the face values of the 100 trials is less than 300.

Ex. 5.4.16. Suppose that $X_1, X_2, \ldots, X_{20}$ are independent random variables with density function

$$f(x) = 2x, \qquad 0 \le x \le 1.$$

Let $S = X_1 + X_2 + \cdots + X_{20}$. Use the central limit theorem to approximate $P(S \le 10)$.

Ex. 5.4.26. Suppose that a basket ball player can score on a particular shot with probability 0.3. Use the central limit theorem to find the approximate distribution of S, the number of success out of 25 independent shots. Find the approximate probabilities that S is less than or equal to 5, 7, 9, and 11 and compare these to the exact probabilities.

Ex. 5.4.27. Prove that if $a_n \to a$, then $(1 + a_n/n)^n \to e^a$.