

## MATH 396 QUIZ I

Note: Please only set up the solutions to the problems. E.g.  $P(X \text{ happens}) = \frac{1}{\sqrt{2\pi}} \int_2^7 e^{-t^2/2} dt$  is an answer preferable to the decimal approximation.

- 1) Suppose that on-the-job injuries in some factory occur at a rate of 0.1 per day. What is the probability that  $k$  accidents will happen in a given five-day work week? Find the probability that the next two injuries will occur within the same five work-day period (it counts if the accidents leapfrog the weekend).
- 2) A basketball team have a 70% foul-shooting percentage. Write an expression giving the exact probability that of their next 100 free-throws they make between 75 and 80 (inclusive). *Hint:* Binomial. Approximate this quantity.
- 3) Suppose 100 fair dice are rolled. What is the probability that the sum of the faces showing,  $S$ , equals 100? How about  $200 \leq S \leq 300$ ?
- 4) Suppose  $X_1$  and  $X_2$  are independent normal random variables with means and variances  $\mu_1, \mu_2, \sigma_1^2, \sigma_2^2$ , respectively. Give the mean and variance of  $X = 2X_1 + 5X_2$ . What happens with higher moments?
- 5) A young couple plan to have children until they have a boy. Assuming the probability of a child's being born a boy is  $\frac{1}{2}$  and that the sexes of successive children are independent, what is the couple's expected family size?
- 6) A fortress which can withstand three hits and still function is being attacked with weapons having a 30% striking rate. What is the probability that it will be incapacitated in the seventh barrage?