Final Exam

DUE ON 10 PM, JAN 4, SATURDAY (TAIPEI TIME)

Please email your solution (scanned handwritten solution or typed solution) to my email address with subject "Final exam submission of NCKU course"

- 1. Let X be non-negative discrete random variable.
 - a. Let a be a positive real value. Show that $Pr(X \ge a) \le E(X)/a$. Hint: Compare $a \times Pr(X \ge a)$ and $E(X) = \sum_x x Pr(X = x)$.
 - b. If X is a Poisson random variable with parameter $\lambda = 1$. What is the exact probability $Pr(X \ge 2)$?
 - c. If X is a Poisson random variable with parameter $\lambda = 1$. Please use the result in part a.) to derive an upper bound for $Pr(X \ge 2)$.

2. You are interested in determining the linear relationship between the flower opening size (nearest tenth of a mm) and the incidence of Fusarium head blight (% of infected spikes). You hire an undergraduate to collect the data and she comes back from the field with the following table based on a collection of 29 wheat plants.

Opening (mm)	1.2	1.4	1.7	1.8	1.9	2.0	2.2	2.4
Mean incidence $(\%)$	5.3	8.6	10.2	12.5	14.4	17.1	18.2	22.3
n	3	5	2	5	5	6	5	3

• The individual measurements used to generate this table were thrown away. Can you still do the regression estimation? If so, what would you do? Explain clearly but actual calculation is not necessary.

3. Let X_1 be a random sample from pdf $f(x|\theta) = 2x/\theta^2$, $x \in (0, \theta)$. Construct a $1 - \alpha$ confidence interval for θ based on X_1 . HINT: X_1/θ has a fixed distribution, i.e., is a pivotal quantity.