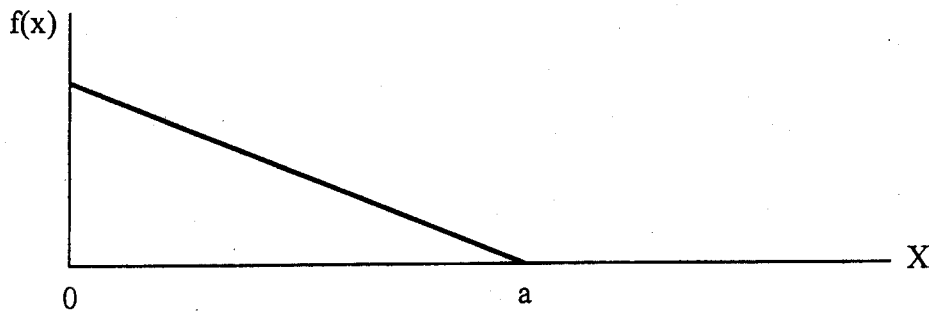


本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

- (6%) Explain why the coefficient of variation can be used to compare the variability of two variables that are measured by different units and have different means and different standard deviations.
- Consider the expression $\text{Cov}(aX, bY+c)$ for random variables X and Y , where a , b , and c are constants.
 - (3%) Show that $\text{Cov}(aX, bY+c) = ab\text{Cov}(X, Y)$.
 - (6%) Give the geometric interpretation for the equality given in (a).
- Let the probability density function of random variable X be defined as the figure given below.
 - (3%) Write down the expression of $f(x)$.
 - (6%) Calculate $E(X)$ and $\text{Var}(X)$.
 - (6%) Let a population follow this probability distribution. A sample $\{x_1, x_2, \dots, x_{50}\}$ is retrieved by using the simple random sampling. What is the probability distribution of the sample mean \bar{x} and why?



- (8%) In performing the hypothesis testing about two population proportions, explain why the test statistic is $z = (\bar{p}_1 - \bar{p}_2) / \sqrt{\bar{p}(1-\bar{p})(\frac{1}{n_1} + \frac{1}{n_2})}$ when $H_0: p_1 - p_2 \geq 0$.
- In performing the hypothesis testing about two population means μ_1 and μ_2 , let the null hypothesis H_0 be $\mu_1 - \mu_2 = 0$. Suppose that both populations are normally distributed, and that population standard deviations σ_1 and σ_2 are known.
 - (6%) When the samples for the two populations are independent, what is the test statistic and why?
 - (6%) When the samples for the two populations are matched, what is the test statistic and why?

(背面仍有題目,請繼續作答)

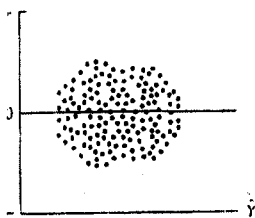
本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

- b. (20%) Please explain the following terms in detail and state the relationship for each pair:
- Standardized Residual vs. Studentized Deleted Residual
 - Prior Distribution vs. Posterior Distribution
 - Binomial Population vs. Multinomial Population
 - Normal Distribution vs. Multinomial Distribution
 - Confidence Interval vs. Prediction Interval
 - Outlier vs. Influential Observation
 - Autocorrelation vs. Multicollinearity
 - Standard Deviation vs. Standard Error
 - Type Error vs. Type II Error
 - Comparisonwise Type I Error Rate vs. Experimentwise Type I Error Rate
7. (10%) Please State the usefulness of χ^2 test, i.e., under what kinds of situations, and for what objectives, will we use χ^2 test? Also, state the assumptions and testing processes in detail.
8. (5%) Please state the pros and cons for using non-parametric analysis?
9. (15%) After running a multiple regression analysis with five independent variables, the following ANOVA table is obtained

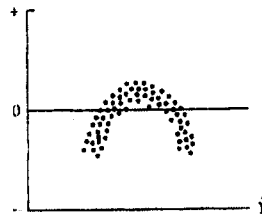
Source	d.f.	SS	MS	F
Regression				
Residual		224		
Total	45	270		

- Please state the assumptions for the multiple regression analysis and how to examine them.
- Please complete the above ANOVA table.
- Calculate $R^2 = ?$
- How to test the hypothesis $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ when $\alpha = 0.05$.
- Suppose the following residual plots may be obtained from the residual analysis for the multiple linear regression, please state the possible causes and remedy strategies for each case:

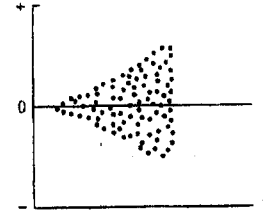
(i).



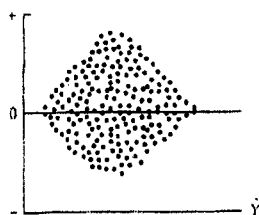
(ii).



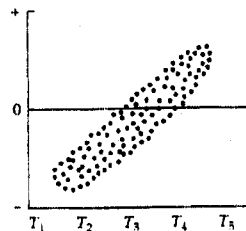
(iii).



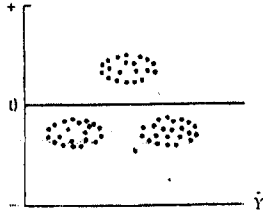
(iv).



(v).



(vi).



(vii).

