Part Three

Vocabulary　10%

Time - - - - - 10 minutes

(数学与应用数学、信息与计算科学专业考生用 – B卷)

考生姓名 ____________　　学号 ____________　　班级 ____________

I. Give the Chinese meaning for each of the following English words.
(共5分, 每小题0.5分)

1. envelope ____________________
2. flag ____________________
3. graph ____________________
4. harmonic ____________________
5. Lie algebra ____________________
6. number theory ____________________
7. orbit ____________________
8. prime ____________________
9. rank ____________________
10. symmetric ____________________

II. Spell the English words according to the following Chinese meaning.
(共5分, 每小题0.5分)

1. 绝对可积 ____________________
2. 解析函数 ____________________
3. 反对称的 ____________________
4. 双线性的 ____________________
5. 逆时针的 ____________________
6. 凸性 ____________________
7. 发散的 ____________________
8. 半径 ____________________
9. 顶点 ____________________
10. 挠率 ____________________

Part Four

Translation 40%

Time - - - - - 50 minutes

(数学与应用数学、信息与计算科学专业考生用 – B卷)

考生姓名 ____________ 学号 ____________ 班级 ____________

Translate the following passages into Chinese.
(共40分, 每小题10分, 请将英文段落的中文翻译写在白纸上)

Passage 1

One of the most commonly used models in reliability theory is the exponential distribution, mainly because of its memoryless property. This property implies that for a system whose lifetime is exponentially distributed, the failure rate function is constant. Indeed, if $X \sim \text{Exp}(\lambda)$, we have: $r(t) = \frac{\lambda e^{-\lambda t}}{e^{-\lambda t}} = \lambda$ for $t \geq 0$. In practice, this is generally not realistic. There are some applications though for which this is acceptable. For example, it seems that the lifetime of an electric fuse that cannot melt only partially is approximately exponentially distributed. The time between the failures of a system made up of a very large number of independent components connected in series can also follow approximately an exponential distribution, if we assume, in particular, that every time a component fails it is immediately replaced by a new one. However, in most cases, the exponential distribution should only be used for t in a finite interval $[t_1, t_2]$.

Passage 2

It is a fundamental proposition in the theory of probability that under certain conditions (repeated independent trials with identical die), the limiting frequency in (10) will indeed exist and be equal to $P(A)$ defined in (11), for "practically all" conceivable sequences of trials. This celebrated theorem, called the Law of Large Numbers, is considered to be the cornerstone of all empirical sciences. In a sense it justifies the intuitive foundation of probability as frequency discussed above. The precise statement and derivation will be given in Chapter 7. We have made this early announcement to quiet your feelings or misgivings about frequencies and to concentrate for the moment on sets and probabilities in the following sections.

Passage 3

Besides the parametric presentation of a curve γ in $\mathbb{R}^3$ there also exist other presentations.
(1) A particular case of the parametric presentation of a curve is *an explicit presentation* of a curve, when the part of a parameter t is played by either the variable x, y, or z.
(2) Let a differentiable map be given by

$$f\colon\ \mathbb{R}^3 \to \mathbb{R}^2, \qquad f = [f_1(x,y,z), f_2(x,y,z)].$$

Then from the implicit function theorem it follows that if $(0,0)$ is a regular value of the map f, then each connected component of the set $T = f^{-1}(0,0)$ is a smooth regular curve in $\mathbb{R}^3$. In other words, under the above given conditions a set of points in $\mathbb{R}^3$ whose coordinates satisfy the system of equations

$$f_1(x,y,z) = 0, \qquad f_2(x,y,z) = 0, \tag{*}$$

forms a smooth regular curve (more exactly, a finite number of smooth regular curves). This method is called *an implicit presentation* of a curve, and the system (*) is called the implicit equations of a curve.

Passage 4

Remarks. (i) For the function $f(x)$ to be differentiable at x_0, it must at least be continuous at that point. However, this condition is not sufficient, as can be seen in the example below.
(ii) If the limit is taken as $x \to x_0^+$ (resp., $x \to x_0^-$) in the previous definition, then the result (if the limit exists) is called the right-hand (resp., left-hand) derivative of $f(x)$ at x_0 and is sometimes denoted by $f'_+(x)$ [resp., $f'_-(x)$]. If $f'(x)$ exists, then $f'_+(x) = f'_-(x)$.
(iii) The derivative of f at an arbitrary point x is also denoted by $\frac{\mathrm{d}}{\mathrm{d}x} f(x)$. If we set $y = f(x)$, then $f'(x_0) \equiv \left.\frac{\mathrm{d}y}{\mathrm{d}x}\right|_{x=x_0}$.
(iv) If we differentiate $f'(x)$, we obtain the second-order derivative of the function f, denoted by $f''(x)$ or $\frac{\mathrm{d}^2}{\mathrm{d}x^2} f(x)$. Similarly, $f'''(x)$ [or $f^{(3)}(x)$, or $\frac{\mathrm{d}^3}{\mathrm{d}x^3} f(x)$] is the third-order derivative of f, and so on.
(v) One way to find the values of x that maximize or minimize the function $f(x)$ is to calculate the first-order derivative $f'(x)$ and to solve the equation $f'(x) = 0$. If $f'(x_0) = 0$ and $f''(x_0) < 0$ [resp., $f''(x_0) > 0$], then f has a relative maximum (resp., minimum) at $x = x_0$. If $f'(x) \neq 0$ for all $x \in \mathbb{R}$, we can check whether the function $f(x)$ is always increasing or decreasing in the interval of interest.