English for Mathematicians, UNIcert® III

PART THREE

◊

GRAMMAR AND LEXIS

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Assignment Sheet

Candidate's Number:

Name:

Surname:

Date:

Candidate's Signature: ________________________________

45 minutes / 55 points

SUBTEST G

Task One

Complete Text 2 with suitable forms of the verbs given. Passive and to-infinitive are considered to be a 'verb form'. Use each verb only once.

estimate – encounter – make – depend – express – read – be – exist – correspond – obtain – define

Text 1

Introduction to interpolation

Anyone who has had occasion to consult tables of mathematical functions is familiar with the method of *linear interpolation* and probably **(1)**_____________ situations in which this method of "**(2)**_____________ between the lines of the table" has appeared **(3)**_____________ unreliable. If more reliable interpolates are desired, it is clearly necessary **(4)**_____________ use of more information than that consisting merely of tabulated values (*ordinates*) of a function, **(5)**_____________ to *two* successive abscissas. Whereas that additional information could consist, for example, of known values of certain *derivatives* of the function at those two points, it is supposed in most of what follows that the interpolation process is to be based only on tabulated values of the function itself, with any further available information reserved for use in **(6)**_____________ the error involved.

There **(7)**_____________ a number of interpolation formulas which have this property, most of which possess certain advantages in certain situations, but no one of which is preferable to all others in all respects. Whereas certain of these formulas **(8)**_____________ explicitly in terms of all the ordinates on which they **(9)**_____________, most of them involve only one or two of the ordinates explicitly and express their dependence upon other ordinates only in terms of differences of ordinates and successive differences of differences. In the general case, when the abscissas are not necessarily equally spaced, the use of so-called divided differences is convenient. The principal purpose of this chapter is **(10)**_____________ such differences and investigate certain of their properties, and **(11)**_____________ a basic interpolation formula from which most of the other formulas of the type described can be deduced.

Task Two

Complete Text 1 with a/an or the, or ∅ for zero article.

Text 2

PYTHAGOREAN NUMBERS

(1) ____ interesting question in **(2)** ____ number theory is connected with **(3)** ____ Pythagorean theorem. The Greeks knew that **(4)** ____ triangle with **(5)** ____ sides 3, 4, 5 is **(6)** ____ right triangle. This suggests the general question: What other right triangles have sides whose lengths are integral multiples of a unit length? **(7)** _____ Pythagorean theorem is expressed algebraically by **(8)** _____ equation

(1) $$a^2 + b^2 = c^2,$$

where a and b are **(9)** _____ lengths of **(10)** _____ legs of **(11)** _____ right triangle and c is the length of **(12)** _____ hypotenuse. **(13)** _____ problem of finding *all* right triangles with sides of **(14)** _____ integral length is thus equivalent to **(15)** _____ problem of finding all integer solutions (a, b, c) of **(16)** _____ equation (1). Any such triple of numbers is called a *Pythagorean number triple*.

SUBTEST H

Correct the punctuation in the sentences below by inserting a comma. Each sentence is either correct or needs one comma.

a/
For example we can search for models where a given path property is true in a given initial state.

b/
Theorem 1 is important for two reasons: First it states that all relations where this theorem is applied contain an inconsistency.

c/
Instead of 20 50 students participated in the experiment.

d/
…
e/
…
f/
…
g/
…

h/
…
i/
…
j/
…

SUBTEST I

Transform the second sentence so that it has a similar meaning to the first. You must use between two and five words including the word given. Do not change the word given.

a/
The same holds for the semiring Mn,n(S). **applies**

The same ________________________________ the semiring Mn,n(S).

b/
Choose point G to represent the number 0. **let**

________________________________ the number 0.

c/
$p \in A$ implies that $p \in A \cup B$. **If**

________________________________ $p \in A \cup B$.

d/
…
e/
…
f/
…
g/
…
h/
…
i/
…
j/
…

SUBTEST J

Complete the text using suitable nouns, adjectives, or adverbs formed from the words given. Each of the words is used only once.

uniform – close – calculate – inaccurate – interpret – require – sufficient – desire – express – algebra

Approximation

In many of the problems which arise in numerical analysis, we are given certain information about a certain function, say $f(x)$, and we are required to obtain additional or improved information, in a form which is appropriate for **(1)**____________ in terms of numbers. Usually $f(x)$ is known or required to be *continuous* over the range of interest.

A technique which is frequently used in such cases can be described, in general terms, as follows. A convenient set of $n+1$ *coordinate functions*, say $\phi_0(x), \phi_1(x), \dots, \phi_n(x)$ is first selected. Then a procedure is invented which has the property that it would yield the desired additional information *simply* and *exactly* (barring **(2)**____________ in calculation) if $f(x)$ were a member of the set S_n of all functions which are **(3)**____________ exactly as linear combinations of the coordinate functions. Next, use is made of an appropriate *selective process* which tends to choose from among all functions in S_n that one, say $y_n(x)$, whose properties are as nearly as possible identified with certain of the known properties of $f(x)$. In particular, it is **(4)**____________ that the process be one which would select $f(x)$ if $f(x)$ were in S_n. The required property of $f(x)$ is then approximated by the corresponding property of $y_n(x)$. Finally, a method is devised for using additional known properties of $f(x)$, which were not employed in the selective process, for estimating the error in this approximation.

Clearly, it is useful, first of all, to choose coordinate functions which are convenient for purposes of **(5)** ____________. The $n + 1$ functions $1, x, x^2 \dots, x^2$, which generate the **(6)** ____________ *polynomials* of degree n or less, are particularly appropriate, since polynomials are readily evaluated and since their integrals, derivatives, and products are *also* polynomials.

Of much greater importance, however, is the natural **(7)** ____________ that it be possible, by taking n **(8)** ____________ large, to be certain that the set S_n of generated functions will contain at least one member which approximates the function $f(x)$ within any preassigned tolerance, on the interval of interest. It is a most fortunate fact that the convenient set S_n, which consists of all polynomials of degree n or less, possesses this property if only $f(x)$ is continuous on that interval and the interval is of finite extent.

This fact was established in 1885 by a famous theorem of Weierstrass, which states, in fact, that any function $f(x)$ which is continuous on a **(9)**____________ interval $[a, b]$ can be **(10)** ____________ approximated within any prescribed tolerance, on that interval, by some polynomial. By this statement we mean that, given any positive tolerance ε, there is a polynomial $p(x)$ such that $|f(x) — p(x)| \leq \varepsilon$ for all x such that $a \leq x \leq b$.