МЕХАНИКО-МАТЕМАТИЧЕСКИЙ ФАКУЛЬТЕТ
КАФЕДРА АНГЛИЙСКОГО ЯЗЫКА

# ПРАКТИЧЕСКОЕ ПОСОБИЕ

для студентов
механико-математического факультета

Выпуск 3

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## TO BE

1. Arithmetic is the language of numbers.
2. Every measurement is a comparison.
3. $\pi$ is an irrational number.
4. A definition is a method of stating what we mean.
5. It is remarkable that although force and distance are both vector quantities, work, which is their product, is not a vector quantity.
6. A body at rest is in equilibrium.
7. If two bodies impinge obliquely, their relative velocity resolved along their common normal after impact is in a constant ratio to their relative velocity before impact resolved in the same direction, and is of opposite sign.
8. Harmonic motion is of frequent occurrence in nature.
9. To a mathematician a fact is of little importance without the proof.
10. To lift a body, or to compress a spring is to make an effort or to exert a force.
11. There are a few basic mathematical notions to be found even in the primitive arithmetic of whole numbers.
12. There were three famous problems which were proposed by the ancient geometers, but which were never solved.
13. The ancients could not solve these problems not because they were not clever enough, but because the problems themselves were insoluble.
14. Dynamics is divided into two branches: statics and kinetics.
15. The problem of squaring the circle was never solved, and we know now that it is insoluble.
16. The oldest known mathematical book in the world was written on papyrus by an Egyptian scribe named Ahmes.
17. The kinetic energy of a body is measured by the amount of work that the body can perform against the impressed forces before its velocity is destroyed.
18. The amount of work is measured by the product of the force times the distance through which the force acts along the line of action.
19. In Euclidean plane geometry, we are specially interested in the points at which straight lines and circles intersect or meet.
20. In some cases it is difficult to say if a substance is to be regarded as solid or fluid.
21. In estimating work only that component of the motion which is in the direction of the force is to be taken into account.
22. The unit must be of the same nature as the quantity which is to be measured, since only like things can be compared.
23. A rigid body is in equilibrium when its velocity of translation is not changing and when its velocity of rotation is not changing.
24. A point is moving with uniform speed when it moves through equal lengths of its paths in equal times, however small these times may be.
25. The upward pull upon a body at any instant while it is being lifted is a force acting on it.
26. In 1667, being appointed a Minor Fellow of Trinity College, Newton began the partly scientific, partly mathematical investigation - that of force of gravity.

## TO HAVE

1. The world we live in has three dimensions.
2. Liquids are those fluids that have a free surface.
3. A rigid body is in equilibrium when it has no acceleration either of translation or rotation.
4. A mass of liquid has a nearly definite bulk though no permanent shape.
5. Gases are those fluids that do not have a free surface, but fill the containing vessel.
6. When calculating the weight of a body we have to multiply its specific gravity by its volume.
7. The problem of constructing a square equal in area to a given circle had to be done by Euclidean methods - with a ruler and compasses only.
8. We can have the computers produce outputs that control movements.
9. The more kinds of jobs we wish to have the computer do, the less efficiently it will be able to do a few jobs.
10. Few mathematicians of the XV century could have their mathematical papers printed at their own expense, like Vieta.
11. People have always found it convenient to count with their fingers.
12. The introduction of the complex number has led to many important developments in mathematics.
13. Since people began to count they have used different words to represent the first few natural numbers.
14. Although Newton's laws of Motion have received considerable criticism, they have been generally admitted to be better than anything that has been proposed in their place.
15. Even before our era Greek mathematicians had mastered the Geometry of the sphere and knew how to handle such things as circles and triangles drawn on the surface of a sphere.
16. We know that Euclid collected all the geometrical facts known in his day, arranged the various theorems in proper order, and added theorems he himself had thought out.
17. A particle tied to one end of a string the other end of which is fixed, and which oscillates in a vertical line having the fixed point as center, is called a simple pendulum.
18. Having established the way to measure the area of any triangle, the Greeks could find the area of any many-sided plane figure, by breaking it up into separate triangles.
19. The Greeks had to use all twenty-four letters of their alphabet, not having hit the brilliant idea of positional notation for their numerals.
20. Pythagoras and his school were the first to have discovered that the earth is a sphere.
21. Archimedes is said to have declared: "give me a place to stand on and I will move the earth".
22. The word "function" appears to have been used first by Descartes in 1637.
23. Whatever may have been the cause of Archimedes' sudden inspiration, filled with excitement at having solved the problem and - more important still - of having hit on an important scientific discovery, he dashed through the streets of Syracuse crying: "Eureka, eureka!"
24. "Ars Magna" written by Cardan was the first book to set forth clearly the idea of negative numbers, the author having persuaded Tartaglia to disclose his method for solving cubic equations to him and revealing it in the book.

**TO DO**

1. Energy is defined as the capacity to do work.
2. If the string becomes slack, the tension is supposed to vanish, and no work is done until the string again becomes tight.
3. Newton did his best to be good at farming, but with no success.
4. Theoretical physics does not explain phenomena, but only classifies and correlates.
5. In most cases we do not solve a single problem but a whole class of problems with various initial conditions.
6. We were discussing so far what happens to a body when forces do not act on it. Let us now consider what happens when forces do act on it.
7. We never see parallel lines. The rails do appear to meet off in the distance.
8. We have phenomena, whose essential nature we do not understand or, if we do understand it, as in the case of the motion of the molecules of a gas, the understanding does us no good and so for all practical purposes we are ignorant.
9. One of the most fundamental differences between the classical mechanics and the relativity mechanics lies in the fact that the one accepts and the other does not accept the basic assumption that the value of a scalar quantity is independent of the motion of the observer and his reference frame relative to the measured quantity.
10. Fermat did not reduce his procedures to rule-of-thumb methods, but he did perform a great number of differentiations by tangent determinations and integrations by computations.
11. A particle is at rest or in motion relative to a stated frame of reference when it does, or does not continue to coincide with the same point of that frame of reference.
12. The quantities with which we deal in Mathematical physics may be classified into "vectors" and "scalars", according as they do or do not involve the idea of direction.
13. Industrial Revolution affected scientific work just as much as it did the social and economic life of the people.
14. If the sun were a perfectly dark body, the stars would shine as brightly as they do now, for they have light of their own; and the moon would be invisible because it depends on the sun to brighten it.
15. Two bodies cannot occupy the same space; any attempt to compel them to do so brings into play a system of repulsive forces tending to keep the two bodies apart.
16. The most common criticism in mathematics is that the students have been trained to manipulate various mathematical procedures efficiently enough, but that they do so with little understanding of the underlying principles.
17. Newton's law of gravitation showed that the planets follow the same pattern of behavior as do the familiar objects moving on the Earth. This fact provided additional and overwhelming evidence for the conclusion that the planets are composed of ordinary matter.
18. At one place in his Principles, Newton does state the correct version of the notion of instantaneous rate of change, but apparently, he did not recognize this fact, for in later writings he gave poorer explanations.
19. We shall assume that f either is in a form or can be brought into a form which makes it a regular function of its arguments: in that case, we have seen that Gauchy's existence theorem applies and that integrals characterized by certain properties, do exist.
20. The condition proved necessary for equilibrium in the above theorem consequently also holds for the exterior forces of every subset of a set which is in equilibrium and if it does hold for every subset it is sufficient for the equilibrium of the given set.
21. Nobody in their right mind would be interested in finding the sixth root of 10, say, just for the pleasure of raising the answer to its fifth power. But as science and civilization expanded, such problems did arise and had to be solved.
22. The common algebraic magnitudes which have nothing to do with direction in space, no directional properties, but are determined by a single real number, are called scalars.
23. $\pi$ is generally defined as the ratio of the circumference of a circle to its diameter, although in many branches of higher mathematics it occurs in questions that have nothing to do with circles.
24. Not until after the humanistic movement revived the study of Greek in Europe did Greek words begin to enter the English vocabulary in great quantity.
25. Especially in considering input-output equipment and systems does one become aware of the great potentialities for employing automatic digital computers in a general language sense as well as in a mathematical sense.

## UNTIL, UNLESS

1. A presentation of Euclidean geometry which satisfies modem standards of rigor was not achieved until recently (1904).
2. Fermat did not discover his extraordinary powers in mathematics until he was about thirty.
3. The change of velocity is not constant unless the change is constant both in magnitude and direction.
4. By a "number", until further notice, we shall mean one of a particular collection of things associated with the ritual of counting.
5. The full significance of Newton's laws of motion cannot be understood until the student takes up the subject of dynamics.
6. Unless the gas is compressed into a very small volume, the average distance between its molecules is very great as compared with their dimensions.
7. Until and unless some totally new principle is discovered, the subject of synthetic projective geometry is not to day a fruitful field for original research.
8. Thales observed from the symmetry of an isosceles triangle that one could not tell whether it had been turned over or not unless it was marked.
9. Many people would not believe this phenomenon until they looked through the telescope themselves and actually saw the moons circling round Jupiter.
10. The operations of addition and subtraction of two vectors as well as multiplication of a vector by a scalar are performed on sliding and attached vectors exactly as if they were free vectors, and the result, when a vector, is thought of as a free vector unless otherwise specified.

**UN-**

1. It is very unlikely that anybody ever will count stars.
2. Unnecessarily large numbers should be avoided.
3. The undue exertion of force will damage the device.
4. Unlike our mountains, those on the moon have no tops, they are hollow.
5. A body in unstable equilibrium possesses maximum potential energy.
6. Mathematicians and philosophers are still quite unable to agree on the meaning of probability.
7. The theory which we develop here is by no means the only possible theory, but it is unquestionably the most natural.
8. The period from the sixth to the seventh centuries is uninteresting so far as the progress is concerned.
9. The scientists before this era undoubtedly had some knowledge of the laws by which energy is governed.
10. In particular cases some of the $a_j$ may be zero, but in practice this will be unlikely to occur.
11. To avoid undue mathematical complications in the development of our subject, we shall deal first with plane mechanics.
12. Unable to think mathematically, some students are computers rather than mathematicians.
13. The three construction problems of antiquity were to be performed with only an unmarked ruler and a compass. No other instruments were to be used.
14. At the present stage of the development of Mathematics our aim to use Symbolic Logic in Algebra may appear unduly ambitions.
15. There is nothing even remotely irrational about "irrational numbers". These are all equally straightforward mathematical entities which happen to be unfortunately named.
16. We shall define Hilbert space as a collection of elements of entirely unspecified nature which satisfies the five postulates given below.
17. It is therefore not unlikely that some of the things said in this book may soon have to be unsaid.
18. It would be convenient if a certain one of the two rectangular coordinate systems now existing were universally adopted by writers, but such is unfortunately not the case.
19. It seems unlikely that the theory of relativity as it is understood at present will remain unmodified.
20. The scope of Galileo's interests and activities was unbelievably broad even for a great intellect of the Age of Genius.
21. Until solar activity again rises, towards the next sunspot maximum, we are unlikely to learn more about these unusual phenomena.
22. Unlike the planets, some of the electrons have alternate orbits along which they may move, and furthermore, they occasionally "jump" from one orbit to another.
23. In order to avoid undue complications the theorems involving complex variables have been formulated as ordinarily applied rather than with the utmost known generality.
24. Engineers deal with units of time, units of heat, units of current etc. On the other hand, in mathematics that very word would mean the least whole number, i.e. the least undivided whole.
25. The reader might, however, still contend that we had attached undue importance to Fourier series, and that there might be other types of trigonometrical series in which a given function could be expanded.
26. Unfortunately Newton did not realize that by use of glasses of different density and powers of refraction of light, the difficulty of chromatic aberration in telescopes would practically be got rid of.
27. In case of neutral equilibrium the level of the center of gravity is not altered by a change in the position of the body. This means that the potential energy of a body in neutral equilibrium is unaffected by any change in the position of the body.
28. There exist various types of tables. The most detailed ones contain the complete factorization of every number up to some limit, but such tables are unwieldy and can give space only for relatively few numbers.
29. The writer hopes that the treatment of the subject is such that the reader can proceed naturally and uninterruptedly to the more advanced parts of the subject that there is nothing he will wish to forget and nothing he will have to unlearn.
30. It is important to have a choice of methods for obtaining latent roots and latent vectors without undue labor, and the object of the present paper is to augment the existing store of such methods.

## NEGATIVE SENTENCES

1. Nothing is permanent except the process of change itself.
2. You could not walk if there were not some friction. Neither could you stop if you were moving.
3. A particle is defined as a material point that occupies no appreciable space.
4. The earth's position is in no sense distinguished. It is neither the outer, nor the inner, nor even the middle planet.
5. Applied mathematics is mathematics. This entails that care in argument is no less important than in pure mathematics.
6. In the new method we introduce no terms or principle but those which are continually used in statics.
7. We choose a case where intuition proves of no value as a protection against erroneous conclusions.
8. No strictly formal proof, experimental or otherwise, can be given of Newton's three Laws of Motion.
9. To measure the kinetic energy of a moving body, we calculate the work which the body can do until it comes to rest.
10. No evidence suggests the slightest trace of erosion (in the Moon) either by wind or by rain, nor should we expect erosion because the Moon is observed to retain no atmosphere.
11. Perhaps never has been achieved more extensive and complete cooperation among such widely varied groups of scientists as in this gigantic task.
12. The union of force and motion is essential to the conception of work. However great the pressure applied, unless the body acted on be moved, no work is done.
13. We never see the first Newton's Law actually exemplified on the Earth because it is practically impossible ever to get rid of all forces during the motion of the body.
14. Unfortunately this scientist's memoir was not published until 1882, and then all his results had been anticipated.
15. It is assumed implicitly that, if the coefficients of an equation satisfy no characteristic condition, then the number of variables is even.
16. Under Galileo's first Law of Motion bodies should continue in straight lines unless disturbed by forces.
17. The traditional doctrines of algebra, trigonometry, analytic geometry and calculus were developed with no attempt to reduce the fundamentals to a simple collection of axioms.
18. Every body preserves in its state of rest or of uniform motion in a right line unless it is compelled to change that state by forces impressed thereon.
19. Since no motion takes place in equilibrium, the idea of time does not enter explicitly into the study of statics, but time is tacitly involved since it appears in the definition of force which we have employed.
20. Since the separate processes of multiplication, division, raising to powers, and extraction of roots cannot give a result more accurate than the data used in obtaining it, no combination of these processes could be expected to give a more accurate result except by accident.
21. We have learnt from the First Law of Motion that every particle, once in motion and acted on by no forces, continues to move in a straight line with uniform velocity. Hence it will not describe a curved line unless acted upon by some external force.
22. Methods Fermat could have mastered would undoubtedly have great consequences in many problems of number theory, but Fermat mentions them nowhere.
23. Several discussions such as that of complex numbers, of power series, of elementary functions and of integrals are sufficiently detailed to be accessible to readers with no mathematical background other than the first course in the calculus.
24. Under the action of the component $F_2$, all the particles of the curved surface will move until the surface has assumed such a form that the component $F_2$, is equal to zero and the surface of the liquid is perpendicular to the force of gravity.
25. In passing from the rarer medium to a denser, the ray is bent towards the normal to the dividing surface, and so a ray of light entering the atmosphere from space is continually bent away from its original direction unless those directions pass through the center of the earth.
26. The "solitary wave" is a wave consisting of a single elevation of height, not necessarily small compared with the depth of the fluid, which, if properly started, may travel for a considerable distance with little or no change of type.

## DOUBLE NEGATION

1. Mars and Venus have atmospheres not dissimilar to ours.
2. The advances of modern sciences are clearly seen to be not inconsiderable.
3. This civilization is not unconsiderably influenced by the effects of Greek culture.
4. Lanchester's books "Aerodynamics" and "Aerodonetics" may be said to have played a part in aerodynamics not unlike that exercised by Newton's "Principia" in astronomy.
5. Not unfrequently the primary meaning of a word dies away and the derivative meaning remains.
6. The ancients were acquainted with some of the properties of $\pi$, although the use of the present symbol was not introduced until many centuries later.
7. It is not unusual to find evidence of partial melting of the lead bullet on extracting it from the block, especially if the latter is of rather hard and resistant wood.
8. What the future holds in store is necessarily a matter of speculation, but it seems not unlikely that what has happened in the past will happen again.
9. The student will see that the idea of solving a differential equation is not dissimilar to the underlying idea in the method of successive approximations that we have already studied.
10. Scientific discoveries follow one another with such rapidity that it is by no means unlikely that in the near future we shall have a much clearer idea of actual mechanism by which each transference of energy is effected.

**IF (any, at all, anything)**

1. There does not appear to be much, if any, lava around the craters of the moon.
2. The method consists in finding out quite in general whether or not a given problem is soluble if at all.
3. Boys and girls still must learn to remember what they are told, if only to pass examinations, but machines now have better memories.
4. The practical civilization of ancient Rome, great though its record is in many fields, contributed little, if anything, to mathematics.
5. We go into further details if for no other reason than that of showing a new approach to the problem.
6. The larger bodies of our solar system differ but little from spheres in shape and their centers of mass are certainly but little distant from their centers of figure - if at all.
7. As far as real positive numbers are concerned, little, if anything, need be added in the first course in algebra to the knowledge the pupil already possesses of these numbers from his study of arithmetic.
8. For our immediate purpose, we shall assume the domain of the surface in the vicinity of a point to be so far restricted that it shall not include the conjugate (if any) of a point along any geodesic.
9. Whoever, if anybody, was responsible for the colossal waste represented by the premature deaths of Abel and Golois, it seems probable that mathematics was needlessly deprived of the natural successors of Gauss.
10. When the expression "infinitesimal" is used, if at all, it is to describe the process by which a variable to which the numbers of a sequence converging to zero are successively ascribed, as values, approaches the limit zero; thus, an infinitesimal is a variable in a state of flux, never a number.

**AS**

1. Any object pushes the air aside as it moves.
2. As we shall see later on, not all objects move in a straight line.
3. As early as the 17th century attempts were made to compress a liquid.
4. A sphere attracts any particle outside itself just as if the whole mass of the sphere were collected in its center.
5. As long as mathematics remains an object of study, Euclid will always find a place in the subject.
6. The earth attracts a pound of air with as much force as it attracts a pound of rock.
7. Vega, bright as it is, is 27 light years distant and there are several dim stars that are nearer.
8. Obvious as problems presented may seem, there is a good deal in them which will repay the reader's attention.
9. It is natural to regard length as a magnitude capable of sign, positive or negative.
10. Speed is uniform when equal distance is passed over in an equal unit of time, that is, the distance travelled varies directly as the time.
11. Being only 1/10,000 as bright as Sirius, its companion star is almost lost in the flood of light from the great star.
12. The last chapter has been much improved as a result of suggestions of Professor with whom I had an opportunity of discussing it.
13. As early as the sixteenth century mathematicians were compelled to introduce expressions for square roots of negative numbers in order to solve all quadratic and cubic equations.
14. The tip of the cue is well chalked so as to make the coefficient of friction of the cue with the ball as large as possible.
15. "As long as the mind of man is fresh, speculation will continue as fascinating as it was in the days of Thales."/Th.Preston/
16. There were quite a few mathematicians who as late as the sixteenth century refused to say that an equation like $x+3= 0$ has the solution $x = -3$.
17. Archimedes wrote on the geometrical properties of the circle, parabola and spiral, as well as on the application of mathematics to various machines.
18. As far as progress in mathematics is concerned, the characteristic of XV century is the advance made in arithmetic and algebra.
19. Newton was familiar with the principles of calculus as early as 1666, but did not publish any account of them until 1687.
20. Speed as we use this word in common speech means rapid movement, but in physics speed is the exact measure of the rate of motion.
21. The binding force holding the protons and the neutrons together, and which is about a million times as strong as the force of gravitation, makes the nucleus hard to split.
22. The words "speed", "work" as well as a number of other common words (such as "force" and "power", for instance) have a very exact meaning in the terminology of physics.
23. The specific heat of real gases changes with temperature, usually increasing as temperature increases, and for most gases also increases with pressure.
24. Electrons are very light; they weigh less than 1/1800 as much as either protons or neutrons; but each one is charged with as much negative electricity as the proton has of positive.
25. This body was not a comet at all but a new planet, and a large one at that, nearly twice as far from the sun as Saturn. It was named Uranus and has a diameter four times as big as the Earth.
26. As the centuries pass, the number of questions man has set himself increases, as does the number of scientists who try to answer them.
27. If the number of equations to be solved is quite large, round-off errors grow as the work progresses, and considerable care must be exercised to prevent their nullifying the final answer.
28. The students of the medieval universities gathered together, forming themselves into societies like those of the trade guilds of the time. This was as much for the cause of learning as for protection from the outsiders.
29. Euler extended our knowledge of the processes of algebra and the methods of mathematical analysis, as well as investigating the motion of liquids - a subject known as hydrodynamics.
30. If a point moves in a straight line so that its acceleration is always directed towards, and varies as its distance from a fixed point in the straight line, the point is said to move with simple harmonic motion.

31. The first man to develop a form of wing construction which contained all the essential elements of a modern aeroplane wing was Henson, who as early as 1842 adopted the Fink Truss for his wing construction.
32. As the particle falls to the ground, it will be noted that the potential energy which it has when at its highest point becomes transformed into kinetic energy, and this goes on continually until the particle reaches the ground, when its store of potential energy becomes exhausted.
33. If the impressed forces act always parallel to a fixed straight line, or if they tend to fixed centers and vary as the distance from those centers, the magnitude and direction of their resultant are the same whether we suppose the body collected into its center of gravity or not.
34. The science of mechanics has as its object the study of the motions of material bodies, and its aim is to describe these motions in the simplest way. From this description of observed facts, generalization can be formulated which permit predictions as to the behavior of other bodies.

**FOR**

1. We must have a choice of methods for obtaining the same results.
2. As for the above theorem, it is no longer useful for our aim.
3. Neither of the principles mentioned above satisfies the conditions, for they do not seem sufficiently adequate for our purpose.
4. The equations presented are concerned for the most part with the ratios of forces.
5. For one thing we must make sure whether the system defined above is applicable in such a case.
6. For the time being we shall consider only the variables which are modules.
7. Such curves do not intersect save for the points J, $J_1$.
8. Had it not been for the help of this eminent scientist, we should have failed in our work.
9. The motion took place long enough for the bodies to become heated.
10. Cycloid is a curve which is well known in geometry for many interesting properties.
11. It is sometimes convenient to write $n^2 \to +\infty$ for $n^2 \to \infty$.
12. The method of classification given below appears in a textbook for the first time.
13. If it were not for the help of Halley, Newton would not have published his great work.
14. For an observation to be of service two facts must be known.
15. I mistook this problem for the one explained elsewhere.
16. This eminent scientist is still given credit for having been the first to draw our attention to such an unusual phenomenon.
17. For the most part the book is concerned with the behavior of fluids under different conditions.
18. Medieval monasteries were practically the only places where the necessary quietness and seclusion could be found for academic pursuits.
19. Geometrical illustrations are illustrations and nothing more, and are employed merely for the sake of clearness of exposition.
20. Newton's theory of light was later shown to be unsound, but it occupied a central place in science for many years.
21. For the present it will be useful to get some practice in the use of these rather cumbersome procedures.
22. For all we know the mathematicians of the XVI century were not familiar with such system of notation.
23. In the Middle Ages alchemy was the study that held men's minds and the search for the philosophical stone was the object of scientific devotion.
24. For two attached vectors to be equal requires that they have the same direction, sense and length.
25. The idea of an "irrational" is deeper than that of an integer; and Pythagoras's theorem is, for that reason, deeper than Euclid's.
26. For example this particular case is important not merely for the intrinsic value of its own result, but because it gives the solution of the general case.
27. But for this man's valuable assistance, I should have found myself in an impossible position of doing the whole work myself.
28. The Romans used letters, some of which were the initial letters of names of the numbers they represent - for example, C (centum) stood for a hundred and M (mille) for a thousand.
29. So far, we have spoken only of diagrams of A-module and indeed for the rest of the chapter the phrase "diagram over A" will be used.
30. In designing a problem-solving system, the programmer often comes equipped with a set of more or less distinct "Methods" - his real task is to find an efficient way for the program to decide where and when the different methods are to be used.
31. For nearly two thousand years it was believed that all heavy objects fell faster than light ones. How this mistaken idea arose is easy to understand, for if a stone and a feather are both dropped, the stone will hit the ground sooner than the feather.
32. The need for complex numbers arises in algebra from the impossibility of finding, among the real numbers, square roots of negative quantities. Thus, the equation $x^2 = -4$ has no real roots. But we may invent an imaginary unit i for which $i^2 = -1$.
33. For the present, only closed cycles will be considered, the analysis of which will result in information necessary for later considerations dealing with actual engine cycle.
34. For the computer to perform a given task, the programmer may choose a routine that will excel others for one of many reasons.

35. In simultaneous equations containing a single independent variable and as many dependent variables as equations, it may be possible to eliminate all but one of these, solve for this, and by substituting in the other equations complete the solution.
36. Except for a strong interest in mechanical contrivances Newton, like many geniuses, showed no special promise as a youth. For the negative reason that he showed no interest in farming, his mother sent him to Cambrige.
37. The mathematics of the XXI century may be very different from our own; perhaps the schoolboy will begin algebra with the theory of substitution groups, as he might now but for inherited habits.
38. Since for every isolated system the momentum and the moment of momentum are constant, it follows that the momentum and the moment of momentum of the system are not altered by an impulsive action, for the forces of an impulse belong to the class of interior forces.
39. When it is desired to find the product of two or more approximate numbers of different accuracies, the more accurate numbers should be rounded off so as to contain one more significant figure than the least accurate factor, for by so doing we eliminate the error due to the more accurate factors and thus make the error of the product due solely to the errors of the less accurate numbers.
40. The law in question is likely to account for this phenomenon.
41. Two expressions will be equal if and only if certain values, unknown, are substituted for particular letters as yet used in the statement.
42. The use of geometrical illustrations does not imply that analysis has any sort of dependence upon geometry; they are employed merely for the sake of clearness of exposition.

## GREEK AND LATIN PLURALS

1. The formula so obtained may be of some use in our further work.
2. The whole apparatus of algebraical formula extends to irrational numbers.
3. The work of the twentieth century, which largely centres around the theory of relativity, has been facilitated by the use of vector analysis.
4. Repeated analyses of the iron bar showed that it had failed by fatigue.
5. In a problem of two đimensions if there is a symmetry with respect to a particular line, this is suggested as a coordinate axis.
6. In setting up the differential equation it is usually better to choose as coordinate axes a configuration defined as completely as possible by the conditions of the problem.
7. In finding the motion of a particle of mass m with reference to any moving axes we may treat the axes as if they were fixed in space, provided that we regard the particle as acted on, in addition to the impressed forces.
8. If we can make the body oscillate under gravity about any axis parallel to the given axis placed in a horizontal position, we can determine by equation the radius of gyration about a parallel axis through the center of gravity.
9. By the use of our chosen coordinate system, we may define what is known as the sense of rotation of a triple of non-coplaner vectors or axes.
10. The arithmetical theory of limit, which is summed up in the general principle of convergence provided a definite criterion for the existence of the limit of a sequence of numbers.
11. The criteria, which determine the number of functions in and therefore the character of the normal form, are found.
12. No reliable criteria are available as to the applicability it of this newly advanced theory.
13. The arithmetical theory of limits, which is summed up in the general principle of convergence, provides a definite criterion for the existence of the limit of a sequence of numbers.
14. This phenomenon is due to the lowering of the temperature down to -200°C.
15. From the theory of relativity the physical phenomena of electromagnetism and gravitation follow as geometrical necessities.
16. The students are expected to take into account this unusual phenomenon.
17. A very complete explanation of electrical phenomena was given by Faraday, Maxwell and their followers.
18. These phenomena are to be taken into consideration when the experiment is repeated.
19. The energy of Universe can neither be increased nor decressed in amount. It is continually being transformed, producing changes and phenomena, but always remaining invariable in amount.
20. The nucleus of every atom is assumed to contain enough protons to account for the nuclear charge.
21. The atom is believed to be made up of a central nucleus of positive electricity around which a number of negatively charged electrons travel in circular orbits.
22. The nucleus of hydrogen consists of one proton. The nucleus of other atoms contains both protons and electrons.
23. A radius is a straight line connecting the center of a circle with its circumference.
24. If the body be a solid, six observed radii of gyration will determine the principal axes and moments at the center of gravity.
25. The great milestone on the road of progress is the introduction of the calculus and its methods.
26. By the way the word "to calculate" is a derivative of calculus (plural calculi), which is the Latin for "stone", the word showing that stones were used in counting.
27. The locus of an equation is a curve containing those points, and only those points, whose coordinates satisfy the equation.
28. In the case of the sun's axial rotation the angular momentum is the sum of the angular momenta of all the particles composing the sun.
29. The velocity of the center of inertia of a system of particles in any given direction is equal to the sum of the momenta of the particles in that direction, divided by the sum of the masses of the particles.
30. In comparison with air water is a much more suitable medium for the transmission of sound.
31. Sound propagates in air more slowly than in liquid or solid media.
32. The minimum possible radius of turning occurs when the centrifugal force exerted towards the center of turning is the maximum aerodynamically possible.

33. Fermat discovered in 1638 a method to find maxima and minima by changing slightly the variable in a simple algebraic equation and then letting the change disappear.
34. The surface of the ocean is the datum for all topological and geological work.
35. With these data we see that the initial error is very small, that it grows rather slowly as n increases, and eventually (since the largest root is real and negative) alternates in sign from step to step.
36. Having been measured with unreliable instruments, the data were incorrect.
37. The engineer is required to obtain necessary data for the physical properties of vapors from experimental and computed values which are usually presented in tables and based on 1 pound of material.
38. The aggregate of real numbers is spoken of as the continuum of real numbers, or the arithmetic continuum.
39. The chief desiderata of this part of the above theory were indirectly and partly supplied by Lie, who worked from a different standpoint.
40. The memory of the computing machine is assumed to have an area for matrix storage which holds a matrix A, to which may be adjoined a matrix B, both sequenced by columns. The memory space available for the matrix or matrices is fixed; it may be filled by a square or rectangular matrix A, as well as by two matrices A and B.
41. In reading the volume presented the only special mathematical equipment required is some knowledge of determinants and matrices.