1. The invention of calculus is usually attributed to
a. Newton and Leibniz **b.** Maclaurin and Taylor **c.** Lagrange and Laplace
d. Bernoulli and Euler **e.** Mersenne and Fermat

2. The mathematician largely responsible for the adoption of the symbols *e*, *i*, and π is

a. Newton **b.** Maclaurin **c.** Taylor **d.** Lagrange **e.** Euler

3. If l'Hopital's rule were properly named for the mathematician who actually discovered it in 1694, it would be called
a. Fermat's rule **b.** Raphson's rule **c.** Bernoulli's rule **d.** Barrow's rule **e.** Leibniz's rule

4. The symbol invented by Wallis is

a. ∞ (infinity) **b.** $\sum$ (summation) **c.** $\int_b^a$ (definite integral)

d. $\oint$ (line integral) **e.** *e* (base of natural logarithms)

5. The differential equation $dy/dx = A(x) + B(x)y + C(x)y^2$ is normally attributed to

a. Roberval **b.** Riccati **c.** Rahn **d.** Rolle **e.** Rheticus

6. The French mathematician who in 1821 introduced an improved definition of limit in his *Cours d'analyse de l'Ecole Polytechnique* is
a. Cauchy **b.** Descartes **c.** Lacroix **d.** Lagrange **e.** Laplace

7. The validity of calculus was questioned in its early development mainly because

a. there was a dispute over whether a definite integral was really the sum of all the values of a magnitude or the limit of a certain characteristic sum
b. the notation used in England was different from that used on the continent
c. fractional exponents were not accepted by most mathematicians
d. there was not a precise meaning of the term *infinitesimal*
e. definitions of the term *limit* involving δ and ε were poorly understood

8. Newton made important discoveries in calculus after he returned home to Lincolnshire in the summer of 1665 when Trinity College was forced to close. Why did it close?

a. The British government cut funding because of a dispute over curriculum.
b. An outbreak of the plague occurred.
c. Extensive remodeling of many of the campus buildings was mandated for safety reasons.
d. Enrollment dropped below 1,000 students.
e. The expertise of staff and students was needed elsewhere after the Great Fire of London.

9. From 1700 until his death, Newton held the title of
a. Chancellor of the Exchequer **b.** Secretary of State for the Northern Department
c. Master of the Rolls **d.** Master of the Mint **e.** Leader of the House of Commons

10. Before he introduced the integral symbol $\int$ in 1675, Leibniz used in its place the abbreviation

a. ubi. **b.** exe. **c.** int. **d.** opr. **e.** omn.

11. Around 1675 Newton wrote a letter to Leibniz in which he concealed a mathematical principle by writing it in the form of an anagram. Translated from Latin to English, it could best be written

a. Given an equation involving any number of fluent quantities, to find the fluxions, and conversely.
b. The General Method, which I had derived some considerable time ago, for measuring the quantity of curves, by means of series, infinite in the number of terms.
c. Fluxions of quantities are in the first ratio of their nascent parts or, what is exactly the same, in the last ratio of those parts as they vanish by defluxion.
d. For fluxions are finite quantities but moments here are infinitely little.
e. $x + y$ and an exponent which is not whole, they are a series without termination.

12. Although we might not accept his claim today, Leibniz argued that the sum of the infinite series $1 - 1 + 1 - 1 + 1 - ...$ is equal to

a. 1 **b.** 0 **c.** $\frac{1}{2}$ **d.** 2 **e.** -1

13. Barrow gave a method of tangents to a curve where the tangent is given as the limit of a chord as the points approach each other. It is usually referred to as Barrow's

a. differential triangle **b.** pursuit curve **c.** quadratrix **d.** vanishing triangle **e.** apothem

14. The English word *calculus* is derived from the Latin word *calculus*, which means

a. calculate **b.** bone **c.** sliding **d.** slave **e.** pebble

15. The modern system of vector analysis is largely due to *Elements of Vector Analysis*, which was published in 1881. It was written by the person who earned the first doctorate in engineering awarded in the United States. His name is

a. Heaviside **b.** Gibbs **c.** Adams **d.** Wiener **e.** Sylvester

16. Leibniz coined the words

a. function and transcendental **b.** fluxion and fluent **c.** integral and radian
d. apothem and logarithm **e.** series and sequence

17. The series first published in 1668 by Nicolaus Mercator, and thus known as Mercator's series, is

a. $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ...$

b. $\arctan(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + ...$

c. $\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + ...$

d. $\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ...$

e. $(1+x)^s = \sum_{n=0}^{\infty} \binom{s}{n} x^n$

18. In 1734 the philosopher George Berkeley published a devastating criticism attacking the lack of rigor in the calculus and disputing the logic on which it was based. The title of his tract is normally shortened to

a. The Analyst **b.** The Iconoclast **c.** The Heretic **d.** The Nemesis **e.** The Skeptic

19. Before 1665, these three men knew that, at least for positive integral values of *n* and in modern notation, $\int_0^a x^n dx = \frac{a^{n+1}}{n+1}$

a. Fibonacci, Oresme, Bradwardine **b.** Regiomontanus, Chuquet, Stifel
c. Heron, Eratosthenes, Eudoxus **d.** Cavalieri, Torricelli, Roberval
e. Zeno, Hippias, Democritus

20. A theorem which gives the approximation of a differentiable function near a point by a polynomial whose coefficients depend only on the derivatives of the function at that point is named for a British mathematician. His name, which appears on the F3 menu of a TI-89 calculator, is

a. Taylor **b.** Wallis **c.** Raphson **d.** Sylvester **e.** Wiles

21. One of the earliest problems posed in the calculus of variations was the *brachistochrone* problem, which involved finding
a. the orbit of a planet with more than two moons
b. the curve traced by a point, acted on only by gravity, in the shortest time
c. the approximate number of prime numbers less than some large number *n*
d. the maximum value of a certain type of power series
e. the perimeter of an ellipse

22. Newton's greatest work is known, in shortened form, as

a. *The Analyst* **b.** *The Introductio* **c.** *The Integral* **d.** *The Descriptio* **e.** *The Principia*

23. Simpson's Rule is named for Thomas Simpson. An interesting claim made in his biography *Thomas Simpson and His Times* is

a. He noticed that he was sleeping every day 15 minutes more than on the previous day. When the arithmetic progression reached 24 hours, he slipped into eternal sleep.
b. He was best known in his lifetime as the author of a Protestant theological work that probed the prophecies of the Apocalypse to prove the Pope was the Antichrist.
c. He had twelve toes.
d. He had to flee to Derby in 1733 after he or his assistant had frightened a girl by dressing up as a devil during an astrology session.
e. Although almost every mathematical theorem is named for the wrong person, Simpson's Rule was really discovered by Simpson.

24. An example of a nondifferentiable continuous function was given

a. in 1660 by Barrow **b.** in 1667 by Newton **c.** in 1700 by Bernoulli
d. in 1732 by Euler **e.** in 1834 by Bolzano

25. The mathematician who is believed to be the first to show that the area of a segment of a parabola is $\frac{4}{3}$ the area of a triangle with the same base and vertex did so by constructing an infinite sequence of triangles and in effect found the sum of an infinite series. He is

a. Archimedes **b.** Abel **c.** Alcuin **d.** Al-Khowarizmi **e.** Abelard

26. Leibniz published the first account of the differential calculus in 1684 in a paper titled (in translation)

a. On the Analysis of Equations Unlimited in the Number of Their Terms
b. Analysis of Infinitesimals for Understanding Curved Lines
c. A New Method for Maxima and Minima, and also for Tangents, which is not Obstructed by Irrational Quantities
d. Elements of the Study of Functions
e. A New Method of the Volume of Wine Casks

27. The first calculus textbook to be published was

a. by Fibonacci, in about 1215 **b.** by Oresme, in about 1380 **c.** by l'Hopital, in 1696
d. by Todhunter, in 1866 **e.** by Dolciani, in 1958

28. The first published volume devoted expressly to the *history of calculus* was

a. *A History of the Calculus and its Conceptual Development* by Boyer
b. *A History of the Differential and Integral Calculus* by Aldrich
c. *The History of Fluxions* by Raphson
d. *The History of the Method of Fluxions* by Todhunter
e. *The Development of the Calculus* by Leibniz

29. Whom did Lagrange, Laplace, and Fourier all describe as the true inventor of the calculus?

a. Fermat **b.** Oresme **c.** Torricelli **d.** Cavalieri **e.** Descartes

30. The number sometimes called Euler's constant, calculated to 16 digits by Euler in 1781, is approximately

a. 0.16 **b.** 0.5772 **c.** 1.618 **d.** 3.14159 **e.** 0.693147