

GRE Mathematics Practice Test 94

Bridge to Standard

English edition / 66 multiple-choice questions

66

Questions

170

Minutes

A–E

One correct choice

Instructions

Choose exactly one answer for each question. Do not use a calculator. Begin timing at Question 1. Use the space provided or separate scratch paper. The answer key follows Question 66; no solutions are included.

Angles are measured in radians. Unless specified otherwise, logarithms are natural, $\mathbb{N} = \{1, 2, 3, \dots\}$, and distances in $\mathbb{R}^n$ are Euclidean. I_n denotes the $n \times n$ identity matrix. Graphs are finite and simple unless stated otherwise.

Difficulty target

A bridge toward standard practice, with routine multi-step questions and a smaller number of challenging concepts. This is cycle 18 of 19, position 4 of 5; difficulty decreases within each cycle.

Difficulty labels are editorial targets, not ETS-equated ratings. No official scaled-score conversion is provided.

Coverage

Calculus / 33	Differential and integral calculus, sequences and series, several variables, vector calculus, and differential equations.
Algebra / 17	Elementary and linear algebra, groups, rings, fields, and number theory.
Additional / 16	Probability, statistics, analysis, topology, complex variables, discrete mathematics, and numerical methods.

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This series uses independently written question families and parameter variants. Related mathematical structures recur across forms; these are training forms, not 95 psychometrically independent official exams.

Scope reference: ETS, *GRE Mathematics Test Practice Book*, ETS official practice-book PDF. Questions are not taken from that book. This booklet is not published or endorsed by ETS.

Questions 1–3

1. If $y'' + 9y = 0$, $y(0) = 19$, and $y'(0) = 5$, find $y(\pi/6)$.

- (A) $\frac{8}{3}$
- (B) $\frac{5}{3}$
- (C) $\frac{10}{3}$
- (D) $-\frac{5}{3}$
- (E) $\frac{5}{6}$

2. Subspaces U, V of $\mathbb{R}^{98}$ have dimensions 5 and 6. What is the largest possible value of $\dim(U \cap V)$?

- (A) 3
- (B) 7
- (C) 4
- (D) 6
- (E) 5

3. Near $(0, 0)$, $z = z(x, y)$ satisfies $z + 19z^2 = x + 3y$ and $z(0, 0) = 0$. Find $z_{xy}(0, 0)$.

- (A) 114
- (B) -114
- (C) -38
- (D) -57
- (E) -3

Questions 4–6

4. Let $X_1, \dots, X_{41}$ be independent uniform random variables on $[0, 1]$. What is $E[\max_i X_i]$?

- (A) $\frac{41}{84}$
- (B) $\frac{41}{42}$
- (C) $\frac{1}{42}$
- (D) $\frac{41}{126}$
- (E) $\frac{83}{84}$

5. If $y' + 19y = 3e^{-19x}$ and $y(0) = 5$, find $y(1)$.

- (A) $\frac{16}{e^{19}}$
- (B) $\frac{8}{e^{19}} + 1$
- (C) $\frac{8}{e^{19}}$
- (D) $-\frac{8}{e^{19}}$
- (E) $\frac{4}{e^{19}}$

6. Let V consist of real polynomials of degree at most 11 that vanish at 90, 91, and 93. Find $\dim V$.

- (A) 11
- (B) 10
- (C) 9
- (D) 8
- (E) 7

Questions 7–9

7. Find the coefficient of x^3 in $e^{2x} \log(1 + 19x)$.

- (A) $\frac{6859}{3}$
- (B) $-\frac{5890}{3}$
- (C) $\frac{5947}{3}$
- (D) $\frac{5890}{3}$
- (E) 11780

8. Independent trials have success probability $1/41$. Let T count trials up to and including the first success. Find $E[T]$.

- (A) 41
- (B) 28
- (C) 15
- (D) 54
- (E) 67

9. Find the total outward flux of $\mathbf{F} = (19x^3, y^3, z^3)$ through the boundary of $[0, 1]^3$.

- (A) 22
- (B) -21
- (C) 42
- (D) $\frac{21}{2}$
- (E) 21

Questions 10–12

10. The roots r, s of $x^2 - 102x + 1080 = 0$ are counted with multiplicity. Find $r^2 + s^2$.
- (A) 8245
(B) 8243
(C) 8246
(D) 8244
(E) 8242
11. Evaluate $\iiint_B 19(x^2 + y^2 + z^2)^{3/2} dV$, where B is the unit ball.
- (A) $\frac{38\pi}{3}$
(B) $\frac{76\pi}{3}$
(C) $\frac{19\pi}{3}$
(D) $-\frac{38\pi}{3}$
(E) $1 + \frac{38\pi}{3}$
12. A uniformly random subset of 41 objects is selected from a collection with 42 red and 43 blue objects. If X is the number of red objects selected, find $E[X]$.
- (A) $\frac{1892}{85}$
(B) $\frac{1807}{85}$
(C) $\frac{861}{85}$
(D) $\frac{3444}{85}$
(E) $\frac{1722}{85}$

Questions 13–15

13. Solve $y'' - 41y' + 418y = 0$ with $y(0) = 1$, $y'(0) = 0$. Find $y(1)$.

- (A) $\frac{(22 - 19e^3)e^{19}}{3} + 1$
(B) $\frac{(-22 + 19e^3)e^{19}}{3}$
(C) $\frac{2(22 - 19e^3)e^{19}}{3}$
(D) $\frac{(22 - 19e^3)e^{19}}{6}$
(E) $\frac{(22 - 19e^3)e^{19}}{3}$

14. For real t , let $M(t) = \begin{pmatrix} t - 90 & 12 & 0 \\ 0 & t - 90 & 1 \\ 0 & 0 & t - 90 \end{pmatrix}$. At $t = 90$, what is $\text{rank } M(t)$?

- (A) 3
(B) 1
(C) 0
(D) 2
(E) 4

15. Evaluate $\int_0^1 x^{19}(1 - x)^2 dx$.

- (A) $\frac{1}{3} \left(\frac{19! 2!}{22!} \right)$
(B) $77 \left(\frac{19! 2!}{22!} \right)$
(C) $\frac{19! 2!}{22!}$
(D) $20 \left(\frac{19! 2!}{22!} \right)$
(E) $22 \left(\frac{19! 2!}{22!} \right)$

Questions 16–18

16. X, Y are independent Poisson variables with means 41 and 42. Given $X + Y = 43$, find $\text{Var}(X \mid X + Y)$.

- (A) $\frac{74046}{6889}$
- (B) $\frac{148092}{6889}$
- (C) $\frac{87824}{6889}$
- (D) $\frac{80935}{6889}$
- (E) $\frac{37023}{6889}$

17. If $f(x, y) = \log(x^2 + y^2)$, $x = e^{19t} \cos(3t)$, and $y = e^{19t} \sin(3t)$, find d^2f/dt^2 at $t = 1$.

- (A) 38
- (B) 1444
- (C) 0
- (D) 740
- (E) 6

18. Let $u = (18, 3)^T$ and $v = (1, 0)^T$. Find the squared norm of the orthogonal projection of v onto $\text{span}(u)$.

- (A) $\frac{73}{37}$
- (B) $\frac{35}{74}$
- (C) $\frac{36}{37}$
- (D) $\frac{183}{74}$
- (E) $\frac{109}{74}$

Questions 19–21

19. The solution of $y' = 19x^3y^2$ has $y(0) = 1/20$. Find $y(1)$.

- (A) $\frac{65}{61}$
- (B) $-\frac{4}{61}$
- (C) $\frac{2}{61}$
- (D) $\frac{4}{61}$
- (E) $\frac{8}{61}$

20. X, Y are independent, with variances 41 and 42. Find $\text{Cov}(X + 2Y, 3X - Y)$.

- (A) 13
- (B) 26
- (C) 39
- (D) 65
- (E) 52

21. Let $f(x) = \log(1 + 19x)$. Find $f^{(3)}(0)$.

- (A) $(-1)^2 2! 19^3$
- (B) $3 \left((-1)^2 2! 19^3 \right)$
- (C) $\frac{1}{3} \left((-1)^2 2! 19^3 \right)$
- (D) $\frac{1}{19} \left((-1)^2 2! 19^3 \right)$
- (E) $-(-1)^2 2! 19^3$

Questions 22–24

22. An idempotent 96×96 real matrix P has rank 2. What is $\text{tr } P$?

- (A) 4
- (B) 0
- (C) 1
- (D) 2
- (E) 3

23. If $y' = 19y$, $y(0) = 1$, what is the coefficient of x^3 in the Maclaurin series of y ?

- (A) $\frac{6859}{6}$
- (B) $-\frac{6859}{6}$
- (C) $\frac{6859}{12}$
- (D) $\frac{6865}{6}$
- (E) $\frac{6859}{3}$

24. A continuous $f : \mathbb{R} \rightarrow \mathbb{R}$ satisfies $f(q) = q^{31}$ for every rational q . Find $f(2)$.

- (A) 2^{32}
- (B) 2^{34}
- (C) 2^{31}
- (D) 2^{30}
- (E) 2^{33}

Questions 25–27

25. Evaluate $\lim_{x \rightarrow 0} \frac{e^{19x} - \sum_{j=0}^2 (19x)^j / j!}{x^3}$.

- (A) $\frac{19^3}{3!}$
- (B) $3 \left(\frac{19^3}{3!} \right)$
- (C) $-\frac{19^3}{3!}$
- (D) $6 \left(\frac{19^3}{3!} \right)$
- (E) $\frac{1}{19} \left(\frac{19^3}{3!} \right)$

26. For $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $b = \begin{bmatrix} 90 \\ 12 \\ 102 \end{bmatrix}$, let x minimize $\|Ax - b\|^2$. Find x_2 .

- (A) 14
- (B) 12
- (C) 10
- (D) 11
- (E) 13

27. Evaluate $\int_0^1 \frac{x^2}{1 + 19x^3} dx$.

- (A) $-\frac{\log(20)}{57}$
- (B) $\log(20)$
- (C) $\frac{\log(20)}{19}$
- (D) $\frac{\log(20)}{57}$
- (E) $\frac{\log(20)}{3}$

Questions 28–30

28. Find the radius of convergence of $\sum_{k=1}^{\infty} k^{31} x^k / 31^k$.

- (A) 11
- (B) 21
- (C) 41
- (D) 31
- (E) 51

29. Let $\mathbf{F} = (19y^3, z^3, x^3)$. Find $(\nabla \times \mathbf{F})(1, 1, 1) \cdot (0, 0, 1)$.

- (A) $-\frac{57}{2}$
- (B) 57
- (C) -57
- (D) -114
- (E) -56

30. What is the coefficient of x^3 in $(x + 18)^5$?

- (A) 3240
- (B) 3239
- (C) 3241
- (D) 3242
- (E) 3238

Questions 31–33

31. For $\mathbf{F} = (19x^3, y^3, z^3)$, find $\nabla \cdot \mathbf{F}$ at $(1, 2, 1)$.

- (A) 73
- (B) 36
- (C) 144
- (D) 72
- (E) -72

32. On $[0, 1]$, f is 31 on rationals and $1/31$ on irrationals. Find its upper Darboux integral minus its lower Darboux integral.

- (A) $\frac{1022}{31}$
- (B) $\frac{991}{31}$
- (C) $\frac{1920}{31}$
- (D) $\frac{480}{31}$
- (E) $\frac{960}{31}$

33. What is the maximum of x^3y^{19} over $x, y \geq 0$ subject to $x + y = 1$?

- (A) $22 \left(\left(\frac{3}{22} \right)^3 \left(\frac{19}{22} \right)^{19} \right)$
- (B) $\frac{1}{2^{22}}$
- (C) $\left(\frac{3}{22} \right)^{19} \left(\frac{19}{22} \right)^3$
- (D) $\frac{57}{484}$
- (E) $\left(\frac{3}{22} \right)^3 \left(\frac{19}{22} \right)^{19}$

Questions 34–36

34. A matrix A satisfies $(A - 91I)(A - 93I) = 0$, and its minimal polynomial has degree two. If $A^2 = uA + vI$, find u .

- (A) 183
- (B) 185
- (C) 182
- (D) 186
- (E) 184

35. Evaluate $\int_0^1 \int_0^x x^{19} y^3 dy dx$.

- (A) $\frac{1}{80}$
- (B) $\frac{1}{24}$
- (C) $\frac{1}{96}$
- (D) $\frac{1}{120}$
- (E) $\frac{1}{92}$

36. A set with 31 elements has the discrete topology. How many of its subsets are simultaneously open and closed?

- (A) 2^{33}
- (B) 2^{34}
- (C) 2^{31}
- (D) 2^{32}
- (E) 2^{30}

Questions 37–39

37. The region $0 \leq x \leq 1$, $0 \leq y \leq 19x^3$ is revolved about the x -axis. Find its volume.

- (A) $1 + \frac{361\pi}{7}$
- (B) $\frac{361\pi}{14}$
- (C) $\frac{722\pi}{7}$
- (D) $-\frac{361\pi}{7}$
- (E) $\frac{361\pi}{7}$

38. Let $V = \begin{bmatrix} 1 & 90 & 8100 \\ 1 & 92 & 8464 \\ 1 & 95 & 9025 \end{bmatrix}$. Find $\det V$.

- (A) 31
- (B) 30
- (C) 29
- (D) 32
- (E) 28

39. What is the radius of convergence about zero of $\sum_{j=1}^{\infty} \frac{(19j)!}{(j!)^{19}} x^{3j}$?

- (A) $\frac{1}{19}$
- (B) $19^{-\frac{3}{19}}$
- (C) 19^{-19}
- (D) $19^{\frac{19}{3}}$
- (E) $19^{-\frac{19}{3}}$

Questions 40–42

40. How many zeros, counted with multiplicity, does $z^{26} + 29z + 1$ have in $|z| < 1$?

- (A) 2
- (B) 4
- (C) 3
- (D) 0
- (E) 1

41. Let $f(x, y) = e^{19x+3y}$. Find $\partial^3 f / \partial x^2 \partial y$ at $(0, 0)$.

- (A) $\frac{9}{361} (3 \cdot 19^2)$
- (B) $3 \cdot 19^2$
- (C) $\frac{1}{3} (3 \cdot 19^2)$
- (D) $\frac{3}{19} (3 \cdot 19^2)$
- (E) $\frac{19}{3} (3 \cdot 19^2)$

42. Let $u = (1, 2, \dots, 96)^T$, $v = (1, 1, \dots, 1)^T$, and $B = I + uv^T$. Find $\det B$.

- (A) 4656
- (B) 4655
- (C) 4657
- (D) 4658
- (E) 4659

Questions 43–45

43. For $x > 0$, $x^2 y'' + (1 - 22)xy' + 57y = 0$, $y(1) = 0$, $y'(1) = 19$. Find $y(e)$.

- (A) $-e^3 + e^{19}$
- (B) $\frac{e^{19}}{22}$
- (C) $e^3 + e^{19}$
- (D) $-\frac{19(1 - e^{16})e^3}{16}$
- (E) $\frac{19(1 - e^{16})e^3}{16}$

44. A meromorphic function has 28 zeros and 2 poles inside a positively oriented simple closed contour, counted with multiplicity, and no zeros or poles on it. Find $\frac{1}{2\pi i} \int f'(z)/f(z) dz$.

- (A) 34
- (B) 42
- (C) 10
- (D) 18
- (E) 26

45. Under $x = u + 19v$, $y = u - 3v$, what is the area of the image of $0 \leq u, v \leq 1$?

- (A) $\frac{1}{22}$
- (B) 22
- (C) 16
- (D) 57
- (E) 484

Questions 46–48

46. Let $R = (\mathbb{Z}/184\mathbb{Z})/([23])$, where $([23])$ is the ideal generated by $[23]$. How many elements does R have?

- (A) 23
- (B) 24
- (C) 21
- (D) 25
- (E) 22

47. Let $F(x) = \int_0^x (x-t)^2 e^{19t} dt$. Find $F^{(3)}(0)$.

- (A) 0
- (B) $\frac{1}{2}$
- (C) 38
- (D) 2
- (E) 6

48. How many nonnegative integer triples (a, b, c) satisfy $a + b + c = 41$?

- (A) 1204
- (B) 1505
- (C) 903
- (D) 602
- (E) 301

Questions 49–51

49. Evaluate $\int_0^{\pi/2} \sin^7 t \cos^{39} t \, dt$.

- (A) $\frac{1}{2} \left(\frac{3! 19!}{2 \cdot 23!} \right)$
- (B) $23 \left(\frac{3! 19!}{2 \cdot 23!} \right)$
- (C) $2 \left(\frac{3! 19!}{2 \cdot 23!} \right)$
- (D) $\frac{3! 19!}{2 \cdot 23!}$
- (E) $1540 \left(\frac{3! 19!}{2 \cdot 23!} \right)$

50. What is the largest integer k such that 2^k divides $99!$?

- (A) 95
- (B) 96
- (C) 97
- (D) 93
- (E) 94

51. For the curve $x = t^3$, $y = t^4 + 19t$, find d^2y/dx^2 at $t = 1$.

- (A) $-\frac{34}{3}$
- (B) $-\frac{34}{9}$
- (C) $\frac{14}{3}$
- (D) $-\frac{19}{3}$
- (E) $\frac{23}{3}$

Questions 52–54

52. A tree has 45 vertices. What is the sum of its vertex degrees?

- (A) 30
- (B) 146
- (C) 117
- (D) 59
- (E) 88

53. Let $F(x) = \int_0^{x^3} e^{19t} dt$. Find $F'(1)$.

- (A) $57e^{19}$
- (B) e^{57}
- (C) $3e^{19}$
- (D) e^{19}
- (E) $\frac{e^{19}}{3}$

54. In the ring $\mathbb{Z}/564\mathbb{Z}$, how many elements are units?

- (A) 184
- (B) 182
- (C) 186
- (D) 183
- (E) 185

Questions 55–57

55. For $f(x) = x^3 e^{19x}$, find $f^{(5)}(0)$.

- (A) $\frac{2}{19} \left(\frac{5! 19^2}{2} \right)$
- (B) $\frac{5! 19^2}{2}$
- (C) $\frac{1}{60} \left(\frac{5! 19^2}{2} \right)$
- (D) $\frac{1}{20} \left(\frac{5! 19^2}{2} \right)$
- (E) $2 \left(\frac{5! 19^2}{2} \right)$

56. A connected planar graph has 44 vertices and 83 edges. How many faces, including the unbounded face, are in a planar embedding?

- (A) 67
- (B) 41
- (C) 28
- (D) 54
- (E) 15

57. Evaluate $\sum_{j=0}^{\infty} \frac{1}{(19+3j)(22+3j)}$.

- (A) $\frac{1}{22}$
- (B) $\frac{3}{19}$
- (C) $\frac{1}{19}$
- (D) $\frac{1}{57}$
- (E) $\frac{1}{3}$

Questions 58–60

58. A permutation consists of disjoint cycles of lengths 8 and 5 and fixes all other points. What is its order?

- (A) 41
- (B) 40
- (C) 38
- (D) 42
- (E) 39

59. Evaluate $\int_0^1 \int_x^1 19y^3 \, dy \, dx$.

- (A) $\frac{19}{4}$
- (B) $\frac{19}{5}$
- (C) $\frac{19}{3}$
- (D) $\frac{19}{20}$
- (E) $\frac{19}{2}$

60. How many integers in $\{1, \dots, 246\}$ are divisible by 2 or 3?

- (A) 164
- (B) 110
- (C) 218
- (D) 56
- (E) 272

Questions 61–63

61. Evaluate $\lim_{x \rightarrow 0} (1 + 19x)^{1/(2x)}$.

- (A) $e^{\frac{19}{2}}$
- (B) e^{20}
- (C) e^{361}
- (D) $e^{\frac{2}{19}}$
- (E) 19

62. In $R = \mathbb{F}_3[x]/(x^{19})$, how many elements are there?

- (A) 3^{18}
- (B) 3^{20}
- (C) 3^{22}
- (D) 3^{19}
- (E) 3^{21}

63. The solution of $y' = 19x^2y^2$, $y(0) = 1$, has its first positive singularity at which x ?

- (A) $\frac{\sqrt[3]{19} \cdot 3^{\frac{2}{3}}}{3}$
- (B) $\frac{19^{\frac{2}{3}}}{19}$
- (C) $\frac{3}{19}$
- (D) $\frac{\sqrt[3]{3} \cdot 38^{\frac{2}{3}}}{38}$
- (E) $\frac{19^{\frac{2}{3}} \sqrt[3]{3}}{19}$

Questions 64–66

64. Let $F_0 = 0$, $F_1 = 1$, and $F_{k+2} = F_{k+1} + F_k$. How many binary strings of length 41 have no adjacent 1s?

- (A) F_{41}
- (B) F_{43}
- (C) F_{44}
- (D) F_{45}
- (E) F_{42}

65. Evaluate $\int_C (3x^2 + 19y) dx + (19x + 3y^2) dy$, where C is the line segment from $(0, 0)$ to $(5, 1)$.

- (A) 222
- (B) 442
- (C) $\frac{221}{2}$
- (D) 221
- (E) -221

66. Integers x satisfy $x \equiv 6 \pmod{7}$ and $x \equiv 7 \pmod{9}$. Find the least nonnegative solution.

- (A) 34
- (B) 35
- (C) 33
- (D) 32
- (E) 36

Answer Key

Practice Test 94 / Questions 1–66

Question	Answer	Question	Answer	Question	Answer
1	B	23	A	45	B
2	E	24	C	46	A
3	B	25	A	47	D
4	B	26	B	48	C
5	C	27	D	49	D
6	C	28	D	50	A
7	D	29	C	51	B
8	A	30	A	52	E
9	E	31	D	53	C
10	D	32	E	54	A
11	A	33	E	55	B
12	E	34	E	56	B
13	E	35	C	57	D
14	D	36	C	58	B
15	C	37	E	59	B
16	A	38	B	60	A
17	C	39	E	61	A
18	C	40	E	62	D
19	D	41	B	63	E
20	C	42	C	64	B
21	A	43	D	65	D
22	D	44	E	66	A

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