

GRE Mathematics Practice Test 79

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 15 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. Let C be $x^2/9 + y^2 = 1$, oriented counterclockwise. Evaluate $\int_C (-y) dx + (16x) dy$.
- (A) $1 + 51\pi$
(B) $\frac{51\pi}{2}$
(C) 51π
(D) -51π
(E) 102π
2. Let N be the 81×81 matrix with ones immediately above the diagonal and zeros elsewhere. Find $\text{rank } N^{13}$.
- (A) 70
(B) 68
(C) 67
(D) 69
(E) 66
3. Let C be the unit circle $x^2 + y^2 = 1$, $z = 3$, counterclockwise viewed from above. Evaluate $\int_C -16y(x^2 + y^2)^2 dx + (16x(x^2 + y^2)^2) dy$.
- (A) 32π
(B) 64π
(C) -32π
(D) $1 + 32\pi$
(E) 16π

Questions 4–6

4. A coin success probability p has uniform prior on $[0, 1]$. After observing 31 successes and 2 failures in independent tosses conditional on p , what is the predictive probability of success on the next toss?

- (A) $\frac{3}{35}$
- (B) $\frac{16}{35}$
- (C) $\frac{32}{35}$
- (D) $\frac{32}{105}$
- (E) $\frac{67}{70}$

5. Find the arc length of $r(t) = (16t, 3t)$ for $0 \leq t \leq 1$.

- (A) $1 + \sqrt{265}$
- (B) $\sqrt{265}$
- (C) $\frac{\sqrt{265}}{2}$
- (D) $-\sqrt{265}$
- (E) $2\sqrt{265}$

6. Let A be the 81×81 matrix whose diagonal entries are 78 and whose off-diagonal entries are 1. What is its smallest eigenvalue?

- (A) 76
- (B) 78
- (C) 75
- (D) 77
- (E) 79

Questions 7–9

7. If $y' = 16y$, $y(0) = 1$, what is the coefficient of x^3 in the Maclaurin series of y ?

- (A) $\frac{4096}{3}$
- (B) $\frac{2051}{3}$
- (C) $\frac{2048}{3}$
- (D) $-\frac{2048}{3}$
- (E) $\frac{1024}{3}$

8. A random variable has mean 0 and variance 31. What upper bound does the Chebyshev inequality give for $P(|X| \geq 62)$?

- (A) $\frac{1}{372}$
- (B) $\frac{123}{124}$
- (C) $\frac{124}{125}$
- (D) $\frac{248}{1}$
- (E) $\frac{1}{124}$

9. Solve $y'' - 35y' + 304y = 0$ with $y(0) = 1$, $y'(0) = 0$. Find $y(1)$.

- (A) $\frac{2(19 - 16e^3)e^{16}}{3}$
- (B) $\frac{(19 - 16e^3)e^{16}}{3}$
- (C) $\frac{(-19 + 16e^3)e^{16}}{3}$
- (D) $\frac{(19 - 16e^3)e^{16}}{3} + 1$
- (E) $\frac{(19 - 16e^3)e^{16}}{6}$

Questions 10–12

10. Positive real numbers x, y satisfy $\log_2 x + \log_2 y = \log_2 825$ and $x + y = 86$. Find xy .
- (A) 826
(B) 824
(C) 827
(D) 825
(E) 823
11. Find the directional derivative of $f(x, y, z) = x^2 + 16y^2 + 3z^2$ at $(1, 1, 1)$ in the direction $(1, 5, 0)$.
- (A) $1 + \frac{81\sqrt{26}}{13}$
(B) $\frac{81\sqrt{26}}{13}$
(C) $\frac{162\sqrt{26}}{13}$
(D) $\frac{81\sqrt{26}}{26}$
(E) $-\frac{81\sqrt{26}}{13}$
12. A box is chosen uniformly from two boxes. Box A contains 36 red and 38 blue balls; box B contains 38 red and 36 blue balls. Two balls are drawn without replacement and both are red. What is the conditional probability that A was chosen?
- (A) $\frac{1963}{2666}$
(B) $\frac{1333}{703}$
(C) $\frac{1333}{630}$
(D) $\frac{1333}{210}$
(E) $\frac{1333}{1333}$

Questions 13–15

13. Evaluate $\lim_{x \rightarrow 0} (1 + 16x)^{1/(2x)}$.

- (A) $e^{\frac{1}{8}}$
- (B) e^{17}
- (C) e^8
- (D) e^{256}
- (E) 16

14. A sequence satisfies $u_0 = 75$ and $u_{k+1} = 1u_k + 11$ for all $k \geq 0$. Find u_6 .

- (A) 141
- (B) 139
- (C) 143
- (D) 142
- (E) 140

15. For $y' = 16y(1 - y/3)$, what is the derivative of the right-hand side with respect to y at the positive equilibrium?

- (A) -16
- (B) 16
- (C) -8
- (D) -32
- (E) -15

Questions 16–18

16. Let $X_1, \dots, X_{36}$ be independent uniform random variables on $[0, 1]$. What is $E[\max_i X_i]$?

- (A) $\frac{1}{37}$
- (B) $\frac{73}{74}$
- (C) $\frac{18}{37}$
- (D) $\frac{36}{37}$
- (E) $\frac{12}{37}$

17. Evaluate $\lim_{x \rightarrow 0} \frac{\sin(16x) - \sum_{j=0}^1 (-1)^j (16x)^{2j+1} / (2j+1)!}{x^5}$.

- (A) $\frac{1}{16} \left(\frac{(-1)^2 16^5}{5!} \right)$
- (B) $5 \left(\frac{(-1)^2 16^5}{5!} \right)$
- (C) $\frac{(-1)^2 16^5}{5!}$
- (D) $-\frac{(-1)^2 16^5}{5!}$
- (E) $16 \left(\frac{(-1)^2 16^5}{5!} \right)$

18. A linear map $T : \mathbb{R}^{82} \rightarrow \mathbb{R}^{84}$ has rank 5. What is its nullity?

- (A) 79
- (B) 75
- (C) 78
- (D) 76
- (E) 77

Questions 19–21

19. For the curve $x = t^3$, $y = t^4 + 16t$, find d^2y/dx^2 at $t = 1$.

- (A) 4
- (B) $-\frac{28}{3}$
- (C) $\frac{20}{3}$
- (D) $-\frac{16}{3}$
- (E) $-\frac{28}{9}$

20. Independent trials have success probability $1/36$. Let T count trials up to and including the first success. Find $E[T]$.

- (A) 12
- (B) 36
- (C) 24
- (D) 48
- (E) 60

21. The region $0 \leq x \leq 1$, $0 \leq y \leq 16x^3$ is revolved about the x -axis. Find its volume.

- (A) $\frac{128\pi}{7}$
- (B) $\frac{256\pi}{7}$
- (C) $1 + \frac{256\pi}{7}$
- (D) $-\frac{256\pi}{7}$
- (E) $\frac{512\pi}{7}$

Questions 22–24

22. What is the dimension of the real vector space of 81×81 symmetric matrices?

- (A) 3319
- (B) 3323
- (C) 3320
- (D) 3322
- (E) 3321

23. For $x > 0$, $x^2y'' + (1 - 19)xy' + 48y = 0$, $y(1) = 0$, $y'(1) = 16$. Find $y(e)$.

- (A) $e^3 + e^{16}$
- (B) $\frac{16(1 - e^{13})e^3}{13}$
- (C) $-\frac{16(1 - e^{13})e^3}{13}$
- (D) $-e^3 + e^{16}$
- (E) $\frac{e^{16}}{19}$

24. A continuous $f : \mathbb{R} \rightarrow \mathbb{R}$ satisfies $f(q) = q^{26}$ for every rational q . Find $f(2)$.

- (A) 2^{28}
- (B) 2^{25}
- (C) 2^{26}
- (D) 2^{27}
- (E) 2^{29}

Questions 25–27

25. If $y'' + 9y = 0$, $y(0) = 16$, and $y'(0) = 5$, find $y(\pi/6)$.

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

26. Let $A = \begin{bmatrix} 1 & 75 & 0 \\ 0 & 1 & 11 \\ 0 & 0 & 1 \end{bmatrix}$. What is the $(1, 2)$ entry of A^5 ?

- (A) 374
- (B) 375
- (C) 373
- (D) 376
- (E) 377

27. Evaluate $\int_0^{\log 2} e^x(e^x + 16)^3 dx$.

- (A) $-\frac{18^4 - 17^4}{4}$
- (B) $\frac{18^4 - 17^4}{4}$
- (C) $\frac{18^4}{4}$
- (D) $18^3 - 17^3$
- (E) $4 \left(\frac{18^4 - 17^4}{4} \right)$

Questions 28–30

28. Find the radius of convergence of $\sum_{k=1}^{\infty} k^{26} x^k / 26^k$.

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

29. For which positive integer m does $\sum_{j=2}^{\infty} \frac{(-1)^j (x-16)^j}{j^{\frac{2}{3}} (\log j)^m}$ converge absolutely at $x = 15$? Give the least such m , or 0 if none exists.

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

30. An invertible 81×81 matrix A has determinant 3. Find $\det(A^T A)$.

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

Questions 31–33

31. Evaluate $\iiint_{x^2+y^2+z^2 \leq 16} (x^2 + y^2 + z^2)^2 dV$.

- (A) $\frac{4\pi 16^{\frac{7}{2}}}{7}$
- (B) $7 \left(\frac{4\pi 16^{\frac{7}{2}}}{7} \right)$
- (C) $\frac{1}{2} \left(\frac{4\pi 16^{\frac{7}{2}}}{7} \right)$
- (D) $\frac{7}{80} \left(\frac{4\pi 16^{\frac{7}{2}}}{7} \right)$
- (E) $\frac{1}{3} \left(\frac{4\pi 16^{\frac{7}{2}}}{7} \right)$

32. On $[0, 1]$, f is 26 on rationals and $1/26$ on irrationals. Find its upper Darboux integral minus its lower Darboux integral.

- (A) $\frac{675}{26}$
- (B) $\frac{727}{26}$
- (C) $\frac{701}{26}$
- (D) $\frac{675}{52}$
- (E) $\frac{675}{13}$

33. Evaluate $\iiint_B 16(x^2 + y^2 + z^2)^{3/2} dV$, where B is the unit ball.

- (A) $-\frac{32\pi}{3}$
- (B) $\frac{64\pi}{3}$
- (C) $1 + \frac{32\pi}{3}$
- (D) $\frac{16\pi}{3}$
- (E) $\frac{32\pi}{3}$

Questions 34–36

34. On the space P_{82} of real polynomials of degree at most 82, define $T(p) = p'$. What is the rank of T ?

- (A) 82
- (B) 80
- (C) 83
- (D) 81
- (E) 84

35. Under $x = u + 16v$, $y = u - 3v$, what is the area of the image of $0 \leq u, v \leq 1$?

- (A) $\frac{1}{19}$
- (B) 13
- (C) 361
- (D) 48
- (E) 19

36. A set with 26 elements has the discrete topology. How many of its subsets are simultaneously open and closed?

- (A) 2^{28}
- (B) 2^{25}
- (C) 2^{27}
- (D) 2^{26}
- (E) 2^{29}

Questions 37–39

37. Find the curvature at $t = 0$ of $r(t) = (3t, 16t^2)$.

- (A) $-\frac{32}{9}$
- (B) $\frac{16}{9}$
- (C) $\frac{64}{9}$
- (D) $\frac{32}{9}$
- (E) $\frac{41}{9}$

38. Subspaces U, V of $\mathbb{R}^{83}$ have dimensions 5 and 6. What is the largest possible value of $\dim(U \cap V)$?

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

39. What is the maximum of x^3y^{16} over $x, y \geq 0$ subject to $x + y = 1$?

- (A) $\left(\frac{3}{19}\right)^3 \left(\frac{16}{19}\right)^{16}$
- (B) $\left(\frac{3}{19}\right)^{16} \left(\frac{16}{19}\right)^3$
- (C) $\frac{48}{361}$
- (D) $\frac{1}{2^{19}}$
- (E) $19 \left(\left(\frac{3}{19}\right)^3 \left(\frac{16}{19}\right)^{16} \right)$

Questions 40–42

40. Let $\zeta = e^{2\pi i/23}$. Find $\sum_{k=0}^{22} \zeta^k$.

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

41. For $f(x, y) = x^2 + 16xy + 3y^2$, what is its maximum directional derivative at $(1, -1)$?

- (A) $2\sqrt{74}$
- (B) -14
- (C) 296
- (D) 24
- (E) 10

42. Let V consist of real polynomials of degree at most 8 that vanish at 75, 76, and 78. Find $\dim V$.

- (A) 8
- (B) 5
- (C) 7
- (D) 6
- (E) 4

Questions 43–45

43. For $D = \{(x, y) : x^2 + y^2 \leq 16\}$, evaluate $\iint_D (x^2 + y^2)^2 dA$.

- (A) $\frac{256\pi}{3}$
- (B) $\frac{4096\pi}{5}$
- (C) $\frac{4096\pi}{3}$
- (D) 4096π
- (E) $\frac{8192\pi}{3}$

44. An analytic function has real part $u(x, y) = x^2 - y^2 + 21x$ and satisfies $f(0) = 0$. Find $\text{Im } f(1 + i)$.

- (A) 30
- (B) 16
- (C) 23
- (D) 9
- (E) 37

45. Let $F(x) = \int_0^{x^3} e^{16t} dt$. Find $F'(1)$.

- (A) $48e^{16}$
- (B) $3e^{16}$
- (C) e^{48}
- (D) e^{16}
- (E) $\frac{e^{16}}{3}$

Questions 46–48

46. How many subgroups does the cyclic group of order 948 have?

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

47. Evaluate $\int_0^1 \int_x^1 16y^3 \, dy \, dx$.

- (A) $\frac{4}{5}$
- (B) $\frac{16}{3}$
- (C) 8
- (D) 4
- (E) $\frac{16}{5}$

48. What is the coefficient of x^2 in $(1 + 2x)^{31}$?

- (A) 1240
- (B) 3100
- (C) 2480
- (D) 620
- (E) 1860

Questions 49–51

49. If $y' + 16y = 3e^{-16x}$ and $y(0) = 5$, find $y(1)$.
- (A) $\frac{4}{e^{16}}$
(B) $\frac{16}{e^{16}}$
(C) $\frac{8}{e^{16}}$
(D) $-\frac{8}{e^{16}}$
(E) $\frac{8}{e^{16}} + 1$
50. How many residues x modulo 114 satisfy $7x \equiv 21 \pmod{114}$?
- (A) 4
(B) 3
(C) 0
(D) 2
(E) 1
51. Find the coefficient of x^3 in the Taylor series of $(1 - 16x)^{-2}$ at zero.
- (A) $-4 \cdot 16^3$
(B) $4 \cdot 16^3$
(C) $\frac{3}{4} (4 \cdot 16^3)$
(D) $\frac{1}{4} (4 \cdot 16^3)$
(E) $\frac{1}{16} (4 \cdot 16^3)$

Questions 52–54

52. How many edges does the complete bipartite graph $K_{31,33}$ have?

- (A) 341
- (B) 1705
- (C) 682
- (D) 1023
- (E) 1364

53. Let $f(x, y) = x^2 + 32xy + (259)y^2$. What is the product of the eigenvalues of the Hessian of f ?

- (A) 6
- (B) 1036
- (C) 3
- (D) 259
- (E) 12

54. The field K has 3^{16} elements. Find $[K : \mathbb{F}_3]$.

- (A) 15
- (B) 17
- (C) 18
- (D) 16
- (E) 14

Questions 55–57

55. Two solutions of $y'' + 16x^1y' + 3y = 0$ have Wronskian $W(0) = 1$. Find $W(1)$.

- (A) e^{-8}
- (B) $e^{-8} + 1$
- (C) $-\frac{1}{e^8}$
- (D) $\frac{1}{2e^8}$
- (E) $\frac{2}{e^8}$

56. How many functions from a set of 36 elements onto a set of 3 elements exist?

- (A) $3^{36} - 2^{36}$
- (B) $3^{36} - 3(2^{36}) - 3$
- (C) 3^{36}
- (D) $3^{36} - 3(2^{36})$
- (E) $3^{36} - 3(2^{36}) + 3$

57. The function $y(x)$ satisfies $y^3 + 16y = 2x$ and $y(0) = 0$. Find $y'(0)$.

- (A) $\frac{1}{8}$
- (B) $-\frac{1}{8}$
- (C) $\frac{2}{19}$
- (D) 16
- (E) 0

Questions 58–60

58. Let $G = \mathbb{Z}/480\mathbb{Z} \times \mathbb{Z}/324\mathbb{Z}$. Find the order of $(1, 1)$.

- (A) 12958
- (B) 12962
- (C) 12960
- (D) 12961
- (E) 12959

59. Evaluate $\int_0^\infty x^3 e^{-16x} dx$.

- (A) $65536 \left(\frac{3!}{16^4} \right)$
- (B) $\frac{1}{3} \left(\frac{3!}{16^4} \right)$
- (C) $16 \left(\frac{3!}{16^4} \right)$
- (D) $\frac{1}{16} \left(\frac{3!}{16^4} \right)$
- (E) $\frac{3!}{16^4}$

60. How many nonnegative integer triples (a, b, c) satisfy $a + b + c = 36$?

- (A) 1171
- (B) 703
- (C) 235
- (D) 937
- (E) 469

Questions 61–63

61. For $f(x) = x^3 e^{16x}$, find $f^{(5)}(0)$.

- (A) $\frac{1}{8} \left(\frac{5! 16^2}{2} \right)$
- (B) $2 \left(\frac{5! 16^2}{2} \right)$
- (C) $\frac{1}{20} \left(\frac{5! 16^2}{2} \right)$
- (D) $\frac{5! 16^2}{2}$
- (E) $\frac{1}{60} \left(\frac{5! 16^2}{2} \right)$

62. How many group homomorphisms $\mathbb{Z}/480\mathbb{Z} \rightarrow \mathbb{Z}/324\mathbb{Z}$ are there?

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

63. For $\mathbf{F} = (16x^3, y^3, z^3)$, find $\nabla \cdot \mathbf{F}$ at $(1, 2, 1)$.

- (A) 126
- (B) $\frac{63}{2}$
- (C) 63
- (D) 64
- (E) -63

Questions 64–66

64. A tree has 40 vertices. What is the sum of its vertex degrees?

- (A) 78
- (B) 130
- (C) 26
- (D) 104
- (E) 52

65. Find the total outward flux of $\mathbf{F} = (16x^3, y^3, z^3)$ through the boundary of $[0, 1]^3$.

- (A) -18
- (B) 18
- (C) 19
- (D) 9
- (E) 36

66. How many 1-dimensional subspaces does $\mathbb{F}_{47}^4$ have?

- (A) $\frac{47^5 - 1}{47 - 1}$
- (B) $\frac{47^6 - 1}{47 - 1}$
- (C) $\frac{47^4 - 1}{47 - 1}$
- (D) $\frac{47^7 - 1}{47 - 1}$
- (E) $\frac{47^3 - 1}{47 - 1}$

Answer Key

Practice Test 79 / Questions 1–66

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

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