

GRE Mathematics Practice Test 10

Standard-Level Target

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 mixed standard-level target, intended to approximate public GRE Mathematics practice in scope and overall demand. This is cycle 1 of 19, position 5 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. Two solutions of $y'' + 2x^1y' + 2y = 0$ have Wronskian $W(0) = 1$. Find $W(1)$.

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

2. Let $u = (1, 2, \dots, 12)^T$, $v = (1, 1, \dots, 1)^T$, and $B = I + uv^T$. Find $\det B$.

- (A) 81
- (B) 78
- (C) 80
- (D) 77
- (E) 79

3. Evaluate $\int_0^\infty x^2 e^{-2x} dx$.

- (A) $\frac{1}{2} \left(\frac{2!}{2^3} \right)$
- (B) $-1 \left(\frac{2!}{2^3} \right)$
- (C) $8 \left(\frac{2!}{2^3} \right)$
- (D) $2 \left(\frac{2!}{2^3} \right)$
- (E) $\frac{2!}{2^3}$

Questions 4–6

4. A box is chosen uniformly from two boxes. Box A contains 7 red and 9 blue balls; box B contains 9 red and 7 blue balls. One ball is drawn and is red. What is the conditional probability that A was chosen?

- (A) $\frac{9}{16}$
- (B) $\frac{7}{32}$
- (C) $\frac{23}{32}$
- (D) $\frac{7}{16}$
- (E) $\frac{7}{48}$

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

- (A) $4^2 - 3^2$
- (B) $-\frac{4^3 - 3^3}{3}$
- (C) $\frac{4^3}{3}$
- (D) $3\left(\frac{4^3 - 3^3}{3}\right)$
- (E) $\frac{4^3 - 3^3}{3}$

6. Let D be a diagonal 12×12 real matrix with distinct diagonal entries. What is the dimension of the space of matrices X satisfying $XD = DX$?

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

Questions 7–9

7. If $f(x, y) = \log(x^2 + y^2)$, $x = e^{2t} \cos(2t)$, and $y = e^{2t} \sin(2t)$, find d^2f/dt^2 at $t = 1$.
- (A) 4
(B) 1
(C) 0
(D) -1
(E) 16
8. Let $X_1, \dots, X_7$ be independent uniform random variables on $[0, 1]$. What is $E[\max_i X_i]$?
- (A) $\frac{1}{8}$
(B) $\frac{7}{16}$
(C) $\frac{7}{24}$
(D) $\frac{7}{8}$
(E) $\frac{15}{16}$
9. For $f(x) = x^2 e^{2x}$, find $f^{(4)}(0)$.
- (A) $\frac{1}{12} \left(\frac{4! 2^2}{2} \right)$
(B) $2 \left(\frac{4! 2^2}{2} \right)$
(C) $\frac{4! 2^2}{2}$
(D) $-1 \left(\frac{4! 2^2}{2} \right)$
(E) $\frac{1}{2} \left(\frac{4! 2^2}{2} \right)$

Questions 10–12

10. What is the remainder when $x^2 + 1$ is divided by $x - 7$?

- (A) 49
- (B) 52
- (C) 48
- (D) 51
- (E) 50

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

- (A) 2
- (B) e^4
- (C) e^2
- (D) e^3
- (E) $e^{\frac{1}{2}}$

12. Independent trials have success probability $1/7$. Let T count trials up to and including the first success. Find $E[T]$.

- (A) 9
- (B) 5
- (C) 3
- (D) 7
- (E) 11

Questions 13–15

13. Let $F(x) = \int_0^{x^2} e^{2t} dt$. Find $F'(1)$.

- (A) $4e^2$
- (B) $\frac{e^2}{2}$
- (C) e^2
- (D) $2e^2$
- (E) e^4

14. Let $P = \text{diag}(\underbrace{1, \dots, 1}_3, \underbrace{0, \dots, 0}_{10})$. What is the dimension of the space of 13×13 real matrices X satisfying $PX = X$?

- (A) 37
- (B) 41
- (C) 40
- (D) 38
- (E) 39

15. If $y' = 2y$, $y(0) = 1$, what is the coefficient of x^2 in the Maclaurin series of y ?

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

Questions 16–18

16. A uniformly random subset of 7 objects is selected from a collection with 8 red and 9 blue objects. If X is the number of red objects selected, find $E[X]$.

- (A) $\frac{73}{17}$
- (B) $\frac{56}{17}$
- (C) $\frac{28}{17}$
- (D) $\frac{90}{17}$
- (E) $\frac{112}{17}$

17. Evaluate $\int_0^1 \int_0^x x^2 y^2 \, dy \, dx$.

- (A) $\frac{1}{6}$
- (B) $\frac{1}{9}$
- (C) $\frac{1}{18}$
- (D) $\frac{1}{24}$
- (E) $\frac{1}{15}$

18. A 3×3 matrix A has characteristic polynomial $(t - 6)(t + 1)(t - 2)$. What is $\text{tr}(A^2)$?

- (A) 41
- (B) 42
- (C) 39
- (D) 40
- (E) 43

Questions 19–21

19. Let $f(x) = \log(1 + 2x)$. Find $f^{(2)}(0)$.

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

20. X, Y are independent Poisson variables with means 7 and 8. Given $X + Y = 9$, find $E[X \mid X + Y]$.

- (A) $\frac{26}{5}$
- (B) $\frac{21}{5}$
- (C) $\frac{31}{5}$
- (D) $\frac{42}{5}$
- (E) $\frac{21}{10}$

21. Let $f(x, y) = x^2 + 4xy + (6)y^2$. What is the product of the eigenvalues of the Hessian of f ?

- (A) 8
- (B) 2
- (C) 4
- (D) 24
- (E) 6

Questions 22–24

22. Let N be the 12×12 matrix with ones immediately above the diagonal and zeros elsewhere. Find $\text{rank } N^{11}$.

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

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

- (A) $\frac{3}{7}$
- (B) $\frac{3}{14}$
- (C) $-\frac{3}{7}$
- (D) $\frac{10}{7}$
- (E) $\frac{6}{7}$

24. For which real a does $f_m(x) = x^{7m}/m^a$ converge uniformly to zero on $[0, 1]$?

- (A) $a > 1$
- (B) All real a
- (C) $a < 0$
- (D) $a = 0$
- (E) $a > 0$

Questions 25–27

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

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

26. Let A be the 12×12 matrix whose diagonal entries are 9 and whose off-diagonal entries are 1. What is its smallest eigenvalue?

- (A) 8
- (B) 6
- (C) 9
- (D) 10
- (E) 7

27. The function $y(x)$ satisfies $y^3 + 2y = 1x$ and $y(0) = 0$. Find $y'(0)$.

- (A) $\frac{1}{5}$
- (B) $\frac{1}{2}$
- (C) 0
- (D) $-\frac{1}{2}$
- (E) 2

Questions 28–30

28. For which real p does $\sum_{k=2}^{\infty} 1/[k(\log k)^{7p}]$ converge?

- (A) $p > 1/7$
- (B) $p \geq 1/7$
- (C) $p > 0$
- (D) All real p
- (E) $p < 1/7$

29. Under $x = u + 2v$, $y = u - 2v$, what is the area of the image of $0 \leq u, v \leq 1$?

- (A) 16
- (B) 4
- (C) $\frac{1}{4}$
- (D) 0
- (E) 8

30. Positive real numbers x, y satisfy $\log_2 x + \log_2 y = \log_2 12$ and $x + y = 8$. Find xy .

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

Questions 31–33

31. Let C be the unit circle $x^2 + y^2 = 1$, $z = 2$, counterclockwise viewed from above. Evaluate $\int_C -2y(x^2 + y^2) dx + (2x(x^2 + y^2)) dy$.

- (A) 8π
- (B) -4π
- (C) $1 + 4\pi$
- (D) 4π
- (E) 2π

32. How many accumulation points in $\mathbb{R}$ does $S = \{1/k : k \geq 1\} \cup \{7 + 1/k : k \geq 1\}$ have?

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

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

- (A) $\frac{5}{2}$
- (B) $\frac{1}{2}$
- (C) -1
- (D) $\frac{1}{4}$
- (E) $\frac{5}{4}$

Questions 34–36

- 34.** A sequence satisfies $u_0 = 6$ and $u_{k+1} = 1u_k + 2$ for all $k \geq 0$. Find u_3 .
- (A) 13
 - (B) 10
 - (C) 12
 - (D) 14
 - (E) 11
- 35.** Find the total outward flux of $\mathbf{F} = (2x^2, y^2, z^2)$ through the boundary of $[0, 1]^3$.
- (A) 2
 - (B) 8
 - (C) 5
 - (D) -4
 - (E) 4
- 36.** How many connected components does $\mathbb{R} \setminus \{1, 2, \dots, 7\}$ have?
- (A) 12
 - (B) 4
 - (C) 10
 - (D) 6
 - (E) 8

Questions 37–39

37. Let C be $x^2/4 + y^2 = 1$, oriented counterclockwise. Evaluate $\int_C (-y) dx + (2x) dy$.

- (A) $1 + 6\pi$
- (B) 12π
- (C) -6π
- (D) 3π
- (E) 6π

38. A linear map $T : \mathbb{R}^{13} \rightarrow \mathbb{R}^{15}$ has rank 2. What is its nullity?

- (A) 11
- (B) 12
- (C) 9
- (D) 10
- (E) 13

39. The region $0 \leq x \leq 1$, $0 \leq y \leq 2x^2$ is revolved about the x -axis. Find its volume.

- (A) $\frac{8\pi}{5}$
- (B) $-\frac{4\pi}{5}$
- (C) $1 + \frac{4\pi}{5}$
- (D) $\frac{2\pi}{5}$
- (E) $\frac{4\pi}{5}$

Questions 40–42

40. The circle $|z| = 2$ is traversed counterclockwise. What is $\frac{1}{2\pi i} \int_{|z|=2} \frac{e^z}{z^8} dz$?

- (A) $7!$
- (B) $1/6!$
- (C) $1/7!$
- (D) $1/14!$
- (E) $1/8!$

41. Evaluate $\sum_{j=0}^{\infty} \frac{1}{(2+2j)(4+2j)}$.

- (A) 1
- (B) $-\frac{1}{4}$
- (C) $\frac{1}{4}$
- (D) $\frac{1}{2}$
- (E) $\frac{1}{8}$

42. What is the dimension of the real vector space of 12×12 symmetric matrices?

- (A) 78
- (B) 80
- (C) 77
- (D) 76
- (E) 79

Questions 43–45

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

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

44. Find the residue of $z^7/(z - 1)^2$ at $z = 1$.

- (A) 3
- (B) 5
- (C) 7
- (D) 11
- (E) 9

45. If $y'' + 4y = 0$, $y(0) = 2$, and $y'(0) = 6$, find $y(\pi/4)$.

- (A) 6
- (B) -3
- (C) $\frac{3}{2}$
- (D) 4
- (E) 3

Questions 46–48

46. Let $A = \begin{bmatrix} 1 & 6 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$. What is the $(1, 2)$ entry of A^2 ?

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

47. For $T = \{x, y, z \geq 0 : x + y + z \leq 1\}$, evaluate $\iiint_T x^2 y^1 dV$.

- (A) $\frac{2! 1!}{6!}$
- (B) $\frac{1}{6} \left(\frac{2! 1!}{6!} \right)$
- (C) $\frac{1}{6}$
- (D) $6 \left(\frac{2! 1!}{6!} \right)$
- (E) $2 \left(\frac{2! 1!}{6!} \right)$

48. How many functions from a set of 7 elements onto a set of 2 elements exist?

- (A) $2^7 - 2$
- (B) $2^7 - 3$
- (C) 2^6
- (D) $2^7 - 1$
- (E) 2^7

Questions 49–51

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

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

50. How many 1-dimensional subspaces does $\mathbb{F}_2^3$ have?

- (A) $\frac{2^6 - 1}{2 - 1}$
- (B) $\frac{2^2 - 1}{2 - 1}$
- (C) $\frac{2^4 - 1}{2 - 1}$
- (D) $\frac{2^3 - 1}{2 - 1}$
- (E) $\frac{2^5 - 1}{2 - 1}$

51. A lamina occupies $0 \leq x \leq 1, 0 \leq y \leq 2x$ and has density $\rho(x, y) = 1$. Find its centroid coordinate $\bar{x}$.

- (A) $\frac{2}{3}$
- (B) $\frac{5}{3}$
- (C) $\frac{1}{3}$
- (D) $\frac{4}{3}$
- (E) $-\frac{2}{3}$

Questions 52–54

52. How many nonnegative integer triples (a, b, c) satisfy $a + b + c = 7$?

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

53. Let $f(x, y) = e^{2x+2y}$. Find $\partial^2 f / \partial x^1 \partial y$ at $(0, 0)$.

- (A) $2(2 \cdot 2^1)$
- (B) $2 \cdot 2^1$
- (C) $\frac{1}{2}(2 \cdot 2^1)$
- (D) $\frac{5}{4}(2 \cdot 2^1)$
- (E) $-1(2 \cdot 2^1)$

54. How many monic irreducible polynomials of degree 2 are there over $\mathbb{F}_2$?

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

Questions 55–57

55. Find the upward flux of $\mathbf{F} = (0, 0, z)$ through $z = 2x^2 + 2y^2$, $0 \leq x, y \leq 1$.

- (A) $\frac{2}{3}$
- (B) $\frac{4}{3}$
- (C) $\frac{7}{3}$
- (D) $-\frac{4}{3}$
- (E) $\frac{8}{3}$

56. A tree has 11 vertices. What is the sum of its vertex degrees?

- (A) 14
- (B) 32
- (C) 8
- (D) 20
- (E) 26

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

- (A) -2
- (B) -4
- (C) -16
- (D) 8
- (E) -8

Questions 58–60

58. How many elements z of $\mathbb{F}_{2^2}$ satisfy $z^2 = z$?

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

59. Evaluate $\int_0^1 x^2(1-x)^1 dx$.

- (A) $3 \left(\frac{2! 1!}{4!} \right)$
- (B) $4 \left(\frac{2! 1!}{4!} \right)$
- (C) $\frac{1}{2} \left(\frac{2! 1!}{4!} \right)$
- (D) $\frac{2! 1!}{4!}$
- (E) $2 \left(\frac{2! 1!}{4!} \right)$

60. A connected planar graph has 10 vertices and 15 edges. How many faces, including the unbounded face, are in a planar embedding?

- (A) 9
- (B) 11
- (C) 5
- (D) 7
- (E) 3

Questions 61–63

61. Solve $y'' - 6y' + 8y = 0$ with $y(0) = 1$, $y'(0) = 0$. Find $y(1)$.

- (A) $(-2 + e^2)e^2$
- (B) $(2 - e^2)e^2 + 1$
- (C) $2(2 - e^2)e^2$
- (D) $(2 - e^2)e^2$
- (E) $-\frac{e^4}{2} + e^2$

62. How many generators does the cyclic group of order 2 have?

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

63. Evaluate $\iiint_{x^2+y^2+z^2 \leq 2} (x^2 + y^2 + z^2)^1 dV$.

- (A) $\frac{1}{2} \left(\frac{4\pi 2^{\frac{5}{2}}}{5} \right)$
- (B) $\frac{4\pi 2^{\frac{5}{2}}}{5}$
- (C) $5 \left(\frac{4\pi 2^{\frac{5}{2}}}{5} \right)$
- (D) $\frac{1}{3} \left(\frac{4\pi 2^{\frac{5}{2}}}{5} \right)$
- (E) $\frac{5}{6} \left(\frac{4\pi 2^{\frac{5}{2}}}{5} \right)$

Questions 64–66

64. How many integers in $\{1, \dots, 42\}$ are divisible by 2 or 3?
- (A) 28
 - (B) 19
 - (C) 46
 - (D) 37
 - (E) 10
65. For $\mathbf{F} = (2x^2, y^2, z^2)$, find $\nabla \cdot \mathbf{F}$ at $(1, 2, 1)$.
- (A) 5
 - (B) 20
 - (C) 10
 - (D) -10
 - (E) 11
66. Let $R = (\mathbb{Z}/10\mathbb{Z})/([2])$, where $([2])$ is the ideal generated by $[2]$. How many elements does R have?
- (A) 1
 - (B) 2
 - (C) 0
 - (D) 4
 - (E) 3

Answer Key

Practice Test 10 / Questions 1–66

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

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