

GRE Mathematics Practice Test 30

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 5 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. Solve $y' + 6y = x^2e^{-6x}$, $y(0) = 0$, and find $y(1)$.

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

2. For $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $b = \begin{bmatrix} 26 \\ 4 \\ 30 \end{bmatrix}$, let x minimize $\|Ax - b\|^2$. Find x_2 .

- (A) 4
- (B) 6
- (C) 3
- (D) 2
- (E) 5

3. For $\mathbf{F} = (6x^2, y^2, z^2)$, find $\nabla \cdot \mathbf{F}$ at $(1, 2, 1)$.

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

Questions 4–6

4. $X_1, \dots, X_{12}$ are independent with common mean and variance 14. With $\bar{X}$ their sample mean, find $E[\sum_i (X_i - \bar{X})^2]$.

- (A) 103
- (B) 52
- (C) 205
- (D) 256
- (E) 154

5. Evaluate $\iiint_B 6(x^2 + y^2 + z^2)^1 dV$, where B is the unit ball.

- (A) $\frac{24\pi}{5}$
- (B) $\frac{48\pi}{5}$
- (C) $-\frac{24\pi}{5}$
- (D) $\frac{12\pi}{5}$
- (E) $1 + \frac{24\pi}{5}$

6. What is the coefficient of x^2 in $(x + 5)^4$?

- (A) 151
- (B) 150
- (C) 149
- (D) 152
- (E) 148

Questions 7–9

7. Evaluate $\int_0^1 \int_x^1 6y^2 \, dy \, dx$.

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

8. A permutation of 14 objects is chosen uniformly. Let Z be the number of fixed points. Find $E[Z]$.

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

9. Let $F(x) = \int_0^{x^2} e^{6t} \, dt$. Find $F'(1)$.

- (A) e^6
- (B) $12e^6$
- (C) e^{12}
- (D) $2e^6$
- (E) $\frac{e^6}{2}$

Questions 10–12

10. A matrix A satisfies $(A - 27I)(A - 29I) = 0$, and its minimal polynomial has degree two. If $A^2 = uA + vI$, find u .

- (A) 55
- (B) 58
- (C) 54
- (D) 56
- (E) 57

11. For $f(x, y) = x^2 + 6xy + 2y^2$, what is its maximum directional derivative at $(1, -1)$?

- (A) $2\sqrt{5}$
- (B) -4
- (C) 2
- (D) 20
- (E) 6

12. A coin success probability p has uniform prior on $[0, 1]$. After observing 12 successes and 2 failures in independent tosses conditional on p , what is the predictive probability of success on the next toss?

- (A) $\frac{13}{32}$
- (B) $\frac{13}{48}$
- (C) $\frac{3}{16}$
- (D) $\frac{29}{32}$
- (E) $\frac{13}{16}$

Questions 13–15

13. Let $f(x) = \log(1 + 6x)$. Find $f^{(2)}(0)$.

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

14. Let $V = \begin{bmatrix} 1 & 26 & 676 \\ 1 & 28 & 784 \\ 1 & 31 & 961 \end{bmatrix}$. Find $\det V$.

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

15. For $T = \{x, y, z \geq 0 : x + y + z \leq 1\}$, evaluate $\iiint_T x^6 y^1 dV$.

- (A) $\frac{6! 1!}{10!}$
- (B) $6 \left(\frac{6! 1!}{10!} \right)$
- (C) $\frac{1}{6} \left(\frac{6! 1!}{10!} \right)$
- (D) $\frac{1}{14}$
- (E) $10 \left(\frac{6! 1!}{10!} \right)$

Questions 16–18

16. A random variable has mean 0 and variance 12. What upper bound does the Chebyshev inequality give for $P(|X| \geq 24)$?

- (A) $\frac{1}{48}$
- (B) $\frac{1}{144}$
- (C) $\frac{49}{96}$
- (D) $\frac{47}{48}$
- (E) $\frac{1}{96}$

17. Evaluate $\int_C (2x + 6y) dx + (6x + 2y) dy$, where C is the line segment from $(0, 0)$ to $(6, 1)$.

- (A) -73
- (B) 73
- (C) 146
- (D) 74
- (E) $\frac{73}{2}$

18. Let $u = (1, 2, \dots, 32)^T$, $v = (1, 1, \dots, 1)^T$, and $B = I + uv^T$. Find $\det B$.

- (A) 527
- (B) 529
- (C) 530
- (D) 531
- (E) 528

Questions 19–21

19. For $x > 0$, $xy' = 6y$ and $y(1) = 1$. Find $y(e^2)$.

- (A) $1 + e^{12}$
- (B) e^{12}
- (C) $2e^{12}$
- (D) $\frac{e^{12}}{2}$
- (E) $-e^{12}$

20. A box is chosen uniformly from two boxes. Box A contains 17 red and 19 blue balls; box B contains 19 red and 17 blue balls. One ball is drawn and is red. What is the conditional probability that A was chosen?

- (A) $\frac{19}{36}$
- (B) $\frac{17}{108}$
- (C) $\frac{17}{72}$
- (D) $\frac{53}{72}$
- (E) $\frac{17}{36}$

21. Solve $y'' - 14y' + 48y = 0$ with $y(0) = 1$, $y'(0) = 0$. Find $y(1)$.

- (A) $(4 - 3e^2)e^6 + 1$
- (B) $(8 - 6e^2)e^6$
- (C) $(-4 + 3e^2)e^6$
- (D) $(4 - 3e^2)e^6$
- (E) $\frac{(4 - 3e^2)e^6}{2}$

Questions 22–24

22. Let D be a diagonal 32×32 real matrix with distinct diagonal entries. What is the dimension of the space of matrices X satisfying $XD = DX$?

- (A) 32
- (B) 33
- (C) 34
- (D) 31
- (E) 30

23. What is the radius of convergence about zero of $\sum_{j=1}^{\infty} \frac{(6j)!}{(j!)^6} x^{2j}$?

- (A) $6^{-\frac{1}{3}}$
- (B) 6^{-3}
- (C) $36(6^{-3})$
- (D) 6^3
- (E) 6^{-6}

24. Which subset of $\mathbb{R}$ is compact, with 12 fixed as displayed?

- (A) $12\mathbb{Z}$
- (B) $\mathbb{Q} \cap [0, 12]$
- (C) $\{0\} \cup \{12/k : k \geq 1\}$
- (D) $\{12/k : k \geq 1\}$
- (E) $(0, 12)$

Questions 25–27

25. Let $F(x) = \int_0^x (x - t)^1 e^{6t} dt$. Find $F^{(2)}(0)$.

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

26. What is the remainder when $x^2 + 1$ is divided by $x - 27$?

- (A) 729
- (B) 730
- (C) 732
- (D) 731
- (E) 728

27. For $y' = 6y(1 - y/2)$, what is the derivative of the right-hand side with respect to y at the positive equilibrium?

- (A) -5
- (B) -3
- (C) -6
- (D) 6
- (E) -12

Questions 28–30

28. For $a_k = (-1)^k + 12/k$, find $\limsup_{k \rightarrow \infty} a_k - \liminf_{k \rightarrow \infty} a_k$.

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

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

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

30. Let $P = \text{diag}(\underbrace{1, \dots, 1}_3, \underbrace{0, \dots, 0}_{30})$. What is the dimension of the space of 33×33 real matrices X satisfying $PX = X$?

- (A) 97
- (B) 100
- (C) 99
- (D) 98
- (E) 101

Questions 31–33

31. Near $(0, 0)$, $z = z(x, y)$ satisfies $z + 6z^2 = x + 2y$ and $z(0, 0) = 0$. Find $z_{xy}(0, 0)$.

- (A) 24
- (B) -48
- (C) -24
- (D) -12
- (E) -2

32. For which real a is $f(x) = x^a$ in $L^{12}(0, 1)$?

- (A) All real a
- (B) $a \geq -1/12$
- (C) $a > -1/12$
- (D) $a > 0$
- (E) $a < 1/12$

33. Evaluate $\lim_{x \rightarrow 0} \frac{\sin(6x) - \sum_{j=0}^0 (-1)^j (6x)^{2j+1} / (2j+1)!}{x^3}$.

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

Questions 34–36

34. A 3×3 matrix A has characteristic polynomial $(t - 26)(t + 1)(t - 2)$. What is $\text{tr}(A^2)$?
- (A) 681
(B) 680
(C) 683
(D) 682
(E) 679
35. If $y' + 6y = 2e^{-6x}$ and $y(0) = 6$, find $y(1)$.
- (A) $\frac{16}{e^6}$
(B) $-\frac{8}{e^6}$
(C) $\frac{8}{e^6}$
(D) $\frac{4}{e^6}$
(E) $\frac{8}{e^6} + 1$
36. A map $T : \mathbb{R} \rightarrow \mathbb{R}$ satisfies $|T(x) - T(y)| \leq |x - y|/12$. If $T(x_*) = x_*$ and $|x_0 - x_*| \leq 1$, what is the smallest guaranteed upper bound for $|T^3(x_0) - x_*|$?
- (A) $\frac{1}{5184}$
(B) $\frac{1}{1728}$
(C) $\frac{1}{1727}$
(D) $\frac{1}{3456}$
(E) $\frac{1}{1729}$

Questions 37–39

37. For which positive integer m does $\sum_{j=2}^{\infty} \frac{(-1)^j(x-6)^j}{j^{\frac{1}{3}}(\log j)^m}$ converge absolutely at $x = 5$? Give the least such m , or 0 if none exists.

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

38. Let N be the 32×32 matrix with ones immediately above the diagonal and zeros elsewhere. Find $\text{rank } N^3$.

- (A) 30
- (B) 28
- (C) 29
- (D) 31
- (E) 27

39. Let $f(x, y) = x^2 + 12xy + (38)y^2$. What is the product of the eigenvalues of the Hessian of f ?

- (A) 2
- (B) 152
- (C) 4
- (D) 8
- (E) 38

Questions 40–42

40. The circle $|z| = 2$ is traversed counterclockwise. What is $\frac{1}{2\pi i} \int_{|z|=2} \frac{e^z}{z^{13}} dz$?

- (A) $1/24!$
- (B) $1/12!$
- (C) $12!$
- (D) $1/11!$
- (E) $1/13!$

41. Evaluate $\int_0^{\pi/2} \sin^5 t \cos^{13} t \, dt$.

- (A) $\frac{2! 6!}{2 \cdot 9!}$
- (B) $28 \left(\frac{2! 6!}{2 \cdot 9!} \right)$
- (C) $9 \left(\frac{2! 6!}{2 \cdot 9!} \right)$
- (D) $\frac{1}{2} \left(\frac{2! 6!}{2 \cdot 9!} \right)$
- (E) $2 \left(\frac{2! 6!}{2 \cdot 9!} \right)$

42. Let A be the 32×32 matrix whose diagonal entries are 29 and whose off-diagonal entries are 1. What is its smallest eigenvalue?

- (A) 28
- (B) 26
- (C) 30
- (D) 29
- (E) 27

Questions 43–45

43. The region $0 \leq x \leq 1$, $0 \leq y \leq 6x^2$ is revolved about the x -axis. Find its volume.

- (A) $\frac{36\pi}{5}$
- (B) $1 + \frac{36\pi}{5}$
- (C) $\frac{72\pi}{5}$
- (D) $\frac{18\pi}{5}$
- (E) $-\frac{36\pi}{5}$

44. Find the residue of $z^{12}/(z-1)^2$ at $z=1$.

- (A) 12
- (B) 8
- (C) 16
- (D) 20
- (E) 4

45. Let $f(x, y) = e^{6x+2y}$. Find $\partial^2 f / \partial x^1 \partial y$ at $(0, 0)$.

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

Questions 46–48

46. Positive real numbers x, y satisfy $\log_2 x + \log_2 y = \log_2 104$ and $x + y = 30$. Find xy .

- (A) 106
- (B) 105
- (C) 104
- (D) 102
- (E) 103

47. For the curve $x = t^2$, $y = t^3 + 6t$, find d^2y/dx^2 at $t = 1$.

- (A) $\frac{9}{4}$
- (B) -3
- (C) $\frac{9}{2}$
- (D) $-\frac{3}{4}$
- (E) $-\frac{3}{2}$

48. What is the least positive multiplicative inverse of 2 modulo 25?

- (A) 5
- (B) 17
- (C) 9
- (D) 13
- (E) 21

Questions 49–51

49. What is the maximum of x^2y^6 over $x, y \geq 0$ subject to $x + y = 1$?

- (A) $8 \left(\left(\frac{2}{8} \right)^2 \left(\frac{6}{8} \right)^6 \right)$
- (B) $\left(\frac{2}{8} \right)^6 \left(\frac{6}{8} \right)^2$
- (C) $\frac{4096}{243} \left(\left(\frac{2}{8} \right)^2 \left(\frac{6}{8} \right)^6 \right)$
- (D) $\frac{1}{2^8}$
- (E) $\left(\frac{2}{8} \right)^2 \left(\frac{6}{8} \right)^6$

50. In the additive group $\mathbb{Z}/48\mathbb{Z}$, find the order of $[3]$.

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

51. Let C be $x^2/4 + y^2 = 1$, oriented counterclockwise. Evaluate $\int_C (-y) dx + (6x) dy$.

- (A) -14π
- (B) 7π
- (C) 28π
- (D) $1 + 14\pi$
- (E) 14π

Questions 52–54

52. How many truth assignments to $p, q, r_1, \dots, r_{10}$ make $p \Rightarrow q$ false?

- (A) 2^9
- (B) 2^{11}
- (C) 2^{13}
- (D) 2^{10}
- (E) 2^{12}

53. If $f(x, y) = \log(x^2 + y^2)$, $x = e^{6t} \cos(2t)$, and $y = e^{6t} \sin(2t)$, find d^2f/dt^2 at $t = 1$.

- (A) 12
- (B) 144
- (C) 80
- (D) 4
- (E) 0

54. How many invertible 2×2 matrices over $\mathbb{F}_{11}$ are there?

- (A) $11^2 11^2$
- (B) $(11^2 - 11^1)(11^2 - 11^2)$
- (C) $(11^2 - 11^0)(11^2 - 11^0)$
- (D) $(11^2 - 11^0)(11^2 - 11^1)$
- (E) $(11^2 - 11^0)$

Questions 55–57

55. Evaluate $\int_0^1 x^6(1-x)^1 dx$.

- (A) $7 \left(\frac{6! 1!}{8!} \right)$
- (B) $4 \left(\frac{6! 1!}{8!} \right)$
- (C) $\frac{6! 1!}{8!}$
- (D) $8 \left(\frac{6! 1!}{8!} \right)$
- (E) $\frac{1}{2} \left(\frac{6! 1!}{8!} \right)$

56. What is the coefficient of x^2 in $(1+2x)^{12}$?

- (A) 176
- (B) 440
- (C) 264
- (D) 88
- (E) 352

57. Find the coefficient of x^4 in $\cos(6x)/(1-x^2)$.

- (A) 54
- (B) 36
- (C) 888
- (D) 37
- (E) -37

Questions 58–60

58. How many permutations in S_{32} consist of one 3-cycle and 29 fixed points?

- (A) 9918
- (B) 9921
- (C) 9920
- (D) 9919
- (E) 9922

59. Find the total outward flux of $\mathbf{F} = (6x^2, y^2, z^2)$ through the boundary of $[0, 1]^3$.

- (A) 4
- (B) -8
- (C) 9
- (D) 16
- (E) 8

60. How many edges does the complete bipartite graph $K_{12,14}$ have?

- (A) 224
- (B) 280
- (C) 112
- (D) 168
- (E) 56

Questions 61–63

61. Find the arc length of $r(t) = (6t, 2t)$ for $0 \leq t \leq 1$.

- (A) $4\sqrt{10}$
- (B) $1 + 2\sqrt{10}$
- (C) $\sqrt{10}$
- (D) $-2\sqrt{10}$
- (E) $2\sqrt{10}$

62. How many subgroups does the cyclic group of order 360 have?

- (A) 22
- (B) 24
- (C) 25
- (D) 23
- (E) 26

63. For $f(x) = x^2e^{6x}$, find $f^{(4)}(0)$.

- (A) $\frac{4!6^2}{2}$
- (B) $2\left(\frac{4!6^2}{2}\right)$
- (C) $\frac{1}{2}\left(\frac{4!6^2}{2}\right)$
- (D) $\frac{1}{12}\left(\frac{4!6^2}{2}\right)$
- (E) $\frac{1}{3}\left(\frac{4!6^2}{2}\right)$

Questions 64–66

64. How many functions from a set of 17 elements onto a set of 2 elements exist?

- (A) $2^{17} - 3$
- (B) 2^{16}
- (C) $2^{17} - 2$
- (D) $2^{17} - 1$
- (E) 2^{17}

65. If $y' = 6y$, $y(0) = 1$, what is the coefficient of x^2 in the Maclaurin series of y ?

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

66. How many residues x modulo 48 satisfy $4x \equiv 28 \pmod{48}$?

- (A) 3
- (B) 5
- (C) 6
- (D) 4
- (E) 2

Answer Key

Practice Test 30 / Questions 1–66

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

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