EXAM-DAY · 90-MIN REVISION CARD

Algebra (Matrices and Determinants)

Print this · Fold it · Carry to the exam-hall gate · Revise once · Then walk in.

FORMULAS & KEY RESULTS

ORDER: an m×n matrix has m rows, n columns. Equality: same order AND each corresponding entry equal.

TRANSPOSE: A' (or A^T) swaps rows and columns. (A')' = A; (A+B)' = A'+B'; (kA)' = kA'; (AB)' = B'A' (REVERSED).

SYMMETRIC: A' = A. SKEW-SYMMETRIC: A' = –A (every diagonal entry = 0).

DECOMPOSITION: A = (1/2)(A+A') + (1/2)(A–A') = symmetric part + skew-symmetric part.

MATRIX MULTIPLY: (m×n)·(n×p) = (m×p); inner dims must match. NOT commutative: AB ≠ BA in general.

IDENTITY: A·I = I·A = A. ZERO product: AB = 0 does NOT imply A = 0 or B = 0.

DET 2×2: |[[a,b],[c,d]]| = ad – bc.

DET 3×3 (expand along row 1): a(ei–fh) – b(di–fg) + c(dh–eg) for [[a,b,c],[d,e,f],[g,h,i]].

COFACTOR: C(i,j) = (–1)^(i+j)·M(i,j), M = minor. Sign grid: + – + / – + – / + – +.

ADJOINT: adj(A) = transpose of the cofactor matrix. INVERSE: A^{-1} = (1/|A|)·adj(A), needs |A| ≠ 0.

2×2 ADJOINT SHORTCUT: adj[[a,b],[c,d]] = [[d,–b],[–c,a]] (swap diagonal, negate off-diagonal).

SOLVE SYSTEM: AX = B ⇒ X = A^{-1}B (if |A| ≠ 0). CRAMER: x = Dx/D, y = Dy/D, z = Dz/D where D = |A|.

TOP 5 PYQ PATTERNS

1 Type / order / equality of matrices (find x, y)
2 marks · 90% of years
State order as rows×columns · for equality set corresponding entries equal · solve the resulting tiny linear system.

2 Symmetric + skew-symmetric decomposition
3 marks · 80% of years
Write A' · form P=(1/2)(A+A') symmetric and Q=(1/2)(A–A') skew · verify P+Q=A and diagonal of Q is zero.

3 Determinant 3×3 / minors and cofactors
3 marks · 85% of years
Draw the sign grid first · expand along the row/column with most zeros · keep the alternating signs explicit.

4 Inverse via adjoint
4 marks · 85% of years
Compute |A| first (stop if zero) · build cofactor matrix · transpose for adj · divide by |A| · verify $A \cdot A^{-1}$ = I.

5 Solve a linear system (matrix method / Cramer)
5 marks · 95% of years
Write AX=B · confirm |A|≠0 · X=A^{-1}B (or Cramer ratios) · substitute back into BOTH/ALL equations to verify.

90-MIN REVISION FLOW

0-15 min
Memorise the five backbone formulas — transpose rules, symmetric/skew test, 2×2 and 3×3 determinant, adjoint→inverse. These five carry the whole chapter.

15-30 min
Drill 4 matrix-multiplication problems. For each, write the order check (inner dims match) BEFORE multiplying, and confirm AB ≠ BA on one example.

30-50 min
Do 3 symmetric/skew decompositions and 3 determinant evaluations. Draw the cofactor sign grid every single time on the 3×3.

50-70 min
Compute the inverse of two 2×2 and one 3×3 matrix via adjoint. Always check |A| ≠ 0 first and verify $A \cdot A^{-1}$ = I at the end.

70-88 min
Solve two full linear systems by the matrix method, substituting back into every equation. This is the guaranteed 5-mark long answer.

88-90 min
Self-check — can you state, without looking, why a singular matrix has no inverse and why every skew-symmetric diagonal entry is zero? If yes, you are chapter-ready.

Confidence, not anxiety. You've practised this all year. Trust your steps. Don't change strategy on exam morning.
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