Class 12 Mathematics

Complete Revision • Solved Examples • Exam Strategy

A practical revision companion

Learn the concept, understand the method, practise with guided examples, and revise with confidence.

Concept Clarity • Guided Practice • Exam Confidence

01 Relations & Functions

Core idea

Relations connect elements; functions assign each input exactly one output. Inverse functions require appropriate one-one behaviour on the chosen domain.

Key formulas / rules

Composition: $(f\circ g)(x)=f(g(x))$. Inverse reverses the input-output mapping when it exists.

Guided solved examples

Example 1. If $f(x)=2x+3$, find $f(4)$.

Solution. 11.

Example 2. Find inverse of $f(x)=x+5$.

Solution. Let $y=x+5$; swap x,y: $x=y+5$; hence $f^{-1}(x)=x-5$.

Common mistakes

Do not find an inverse without considering whether it is a function.

Exam tip

Swap x and y and solve systematically.

Practice

1. Find composition of $f(x)=x+1$ and $g(x)=2x$.

2. State a condition needed for an inverse function.

02 Matrices & Determinants

Core idea

Matrices organise numbers in rows and columns. Determinants provide a scalar associated with square matrices and support solution methods.

Key formulas / rules

For [[a,b],[c,d]], determinant=ad-bc. Matrix multiplication requires compatible dimensions.

Guided solved examples

Example 1. Find determinant of [[2,3],[1,4]].

Solution. $2\times4-3\times1=5$.

Example 2. Add [[1,2],[3,4]] and [[4,3],[2,1]].

Solution. [[5,5],[5,5]].

Common mistakes

Matrix multiplication is not generally commutative.

Exam tip

Check dimensions before multiplication.

Practice

1. Multiply two 2×2 matrices.

2. Find determinant of [[5,2],[3,1]].

03 Continuity & Differentiability

Core idea

Continuity means no break at the point under consideration; differentiability is a stronger local condition.

Key formulas / rules

For continuity at a, left limit=right limit=f(a). Basic derivative rules apply where functions are differentiable.

Guided solved examples

Example 1. Differentiate x^3.

Solution. $3x^2$.

Example 2. Is a polynomial continuous everywhere?

Solution. Yes, every polynomial is continuous for all real x.

Common mistakes

Do not assume differentiability at every point without checking.

Exam tip

Evaluate left and right behaviour separately when needed.

Practice

1. Differentiate $x^2 \sin x$ using product rule.

2. State the continuity condition at x=a.

04 Applications of Derivatives

Core idea

Derivatives measure rate of change and help identify increasing/decreasing behaviour and extrema.

Key formulas / rules

Critical points occur where f'(x)=0 or f' is undefined, subject to domain and problem conditions.

Guided solved examples

Example 1. For $f=x^2$, find critical point.

Solution. f'=2x; f'=0 at x=0.

Example 2. Interpret positive derivative on an interval.

Solution. The function is increasing on that interval under the usual differentiability conditions.

Common mistakes

Check endpoints and domain in optimisation problems.

Exam tip

Use a sign chart when classifying intervals.

Practice

1. Find critical points of x^3-3x.

2. Explain how a second derivative can help classify a stationary point.

05 Integrals

Core idea

Integration accumulates quantities and reverses differentiation. Definite integrals give signed area/accumulation.

Key formulas / rules

∫x^n dx=x^(n+1)/(n+1)+C for n≠-1. Definite integral: evaluate antiderivative at upper and lower limits.

Guided solved examples

Example 1. Integrate $3x^2$.

Solution. x^3+C.

Example 2. Evaluate ∫0^2 x dx.

Solution. [x²/2]0^2=2.

Common mistakes

Do not forget +C for indefinite integrals.

Exam tip

Differentiate your antiderivative to verify.

Practice

1. Integrate $5x^4$.

2. Evaluate ∫1^3 2x dx.

06 Differential Equations

Core idea

A differential equation relates a function to its derivatives. Solutions satisfy the equation and may include constants.

Key formulas / rules

For simple separable forms, separate variables and integrate; apply an initial condition to determine constants.

Guided solved examples

Example 1. For dy/dx=2x, find y.

Solution. Integrate: y=x²+C.

Example 2. If y(0)=3, find C.

Solution. 3=0+C, so C=3; y=x²+3.

Common mistakes
Apply the initial condition after finding the general solution.

Exam tip
Differentiate the final answer to check.

Practice

1. Solve dy/dx=3x².

2. Apply y(1)=5 to the previous form.

07 Vectors & 3D

Core idea

Vectors have magnitude and direction. Dot product connects vectors with angles; line equations use a point and direction vector.

Key formulas / rules
|a|=√(a1²+a2²+a3²). a·b=|a||b|cosθ. A line can be r=a+λb.

Guided solved examples

Example 1. Find magnitude of (2,3,6).

Solution. √(4+9+36)=7.

Example 2. Are (1,2,0) and (2,-1,0) perpendicular?

Solution. Dot product=2-2=0, so yes.

Common mistakes
Do not confuse scalar and vector products.

Exam tip
Use the dot product test for perpendicularity.

Practice

1. Find dot product of (1,0,2) and (3,4,-1).

2. Write a vector equation of a line through a point with a direction vector.

08 Probability

Core idea

Probability quantifies uncertainty. Conditional probability updates probability when information is known.

Key formulas / rules

P(A|B)=P(A∩B)/P(B). For independent events, P(A∩B)=P(A)P(B).

Guided solved examples

Example 1. Two independent events have probabilities 1/2 and 1/3. Find P(A∩B).

Solution. 1/6.

Example 2. Explain conditional probability.

Solution. It measures the probability of A when B is known to have occurred.

Common mistakes

Check whether events are independent before multiplying.

Exam tip

Write the event notation clearly.

Practice

1. A die is rolled twice. Find probability both results are 6.

2. Give an example of dependent events.

Rapid Revision Sheet

Functions
Composition and inverses; check domain/range and one-one conditions.
Matrices
Know dimensions, multiplication rules and 2×2 determinant formula.
Calculus
Continuity → derivatives → applications → integration → differential equations.
Vectors & 3D
Magnitude, dot product, direction vectors and line representation.
Probability
Conditional probability and independence; define events clearly.

Mixed Practice Test

1. Find inverse of f(x)=2x-1.
2. Find determinant of [[3,1],[2,5]].
3. Differentiate x^3+4x^2.
4. Evaluate ∫0^1 $3x^2$ dx.
5. Find magnitude of (1,2,2).
6. Two independent events have probabilities 1/2 and 1/4. Find their joint probability.

Answer Key

1. $f^{-1}(x)=(x+1)/2$.

2. 13.

3. $3x^2+8x$.

4. 1.

5. 3.

6. 1/8.

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