INKMATHS FLASHCARDS

# Proof and numerical methods

5 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in precise wording, the standard results the formulae booklet does not print, a check-yourself question per topic, and the slips that lose marks. The same cards run on the website with spaced-repetition scheduling, at inkphysics.co.uk/maths/flashcards.

**RECALL**

State the shape of a proof by contradiction.

PROOF AND NUMERICAL METHODS

**DEFINITION**

Define: Proof by exhaustion.

PROOF AND NUMERICAL METHODS

**RECALL**

State what a change of sign does and does not prove.

PROOF AND NUMERICAL METHODS

**RECALL**

State whether the trapezium rule over- or under-estimates.

PROOF AND NUMERICAL METHODS

**SPOT THE ERROR**

Say what is wrong with this claim:

Newton-Raphson always converges to the root nearest your starting value.

PROOF AND NUMERICAL METHODS

DEFINITION

Splitting the statement into a finite set of cases that between them cover every possibility, then checking each one. It only proves anything if the cases genuinely leave nothing out, so say why they do.

PROOF AND NUMERICAL METHODS

RECALL

Assume the opposite of what you want, reason correctly until you reach something impossible, then conclude the original statement. Open with the assumption in words and close by naming the contradiction you hit. Both sentences carry marks and both are routinely left out.

PROOF AND NUMERICAL METHODS

RECALL

The chords lie above a curve that bends upwards, so the rule overestimates there. They lie below a curve that bends downwards, so it underestimates. Sketch the curve with one trapezium on it and the answer is visible, which is what the examiner wants to see said.

PROOF AND NUMERICAL METHODS

RECALL

If f is continuous on the interval and f(a) and f(b) have opposite signs, there is at least one root between them. Continuity is the condition people skip. An asymptote flips the sign with no root there at all, and a pair of roots close together produces no sign change even though both exist.

PROOF AND NUMERICAL METHODS

SPOT THE ERROR

Near a stationary point f'(x) is tiny, the tangent is almost flat, and it meets the axis a long way off. The next value can land beyond a different root or outside the domain altogether. A starting value exactly at a stationary point fails outright, because you would be dividing by zero.

PROOF AND NUMERICAL METHODS