Experiences and Approaches

Maths and statistics support for neurodivergent students

Emma Cliffe

Plan

Plan

- Some experience students might have
- Some approaches I've used

Some experiences students might have

Joe, an engineer

Joe, an engineer

"I'm having real problems with maths, the other modules have good workbooks"

- Verbal comprehension: superior
- Perceptual reasoning: high average
- Working memory: low average (significantly weak)
- Processing speed: average range (relatively weak)
- Word recognition: below average (significantly weak)
- Writing speed: well below average (significantly weak)
- Writing untidy and difficult to read

Mary, a mathematician

Mary, a mathematician

"I feel so stupid, maths is what I have always been good at and now I can't understand any of it."

- Verbal comprehension: superior
- Perceptual reasoning: high average
- Working memory: superior
- Processing speed: average range (relatively weak)
- Word recognition: average range (significantly weak)
- Writing speed: average range (relatively weak)
- Writing generally legible and coherent

Ali, a chemist

Ali, a chemist

"I have a student I don't know how to help ... this involves seeing molecules in 3D and determining their symmetry. She finds this particularly difficult and although we made some progress, she became rather distressed through frustration"

- Working memory and processing speed commensurate with her verbal comprehension and perceptual processing skills
- No reading difficulties
- Significantly weak fine motor control
- Difficulties with co-ordination and spatial awareness

Nat, a sports scientist

Nat, a sports scientist

"She is having significant problems with her maths module".

Dyscalculia screener suggested difficulties with:

- Comparing relative sizes of numbers (word, symbol and visual-spatial)
- Concepts and inferences about operations on numbers or relationships between them
- Understanding time

Some approaches I've used

In the moment

In the moment

- Multisensory approach with consistent colour and images
- Consistently link symbol, word and process
- Break problems down into small, manageable steps
- Read maths aloud, ‘think’ aloud yourself
- Encourage thinking aloud, act as a scribe if needed
- Use visualisations, concrete examples and concrete objects
- Use flow charts connected to a concrete example
- Use concept maps to highlight relationships and connections between the abstract and the concrete

In the moment cont.

In the moment cont.

- Encourage student to use multisensory approaches
- Encourage overlearning e.g. index cards, electronic tests
- Encourage metacognition, reflection on problem solving
- Bring working memory overload to the student's awareness
- Find approaches which reduce working memory load
- Block out information not in use, break up large sections of text, ensure student can change font, colour, have content read aloud if it helps
- Experiment with different ways to capture thought process and to write up work

Building strategies

Building strategies

- Notetaking for mathematics, structured annotation
- Using expanding symbol range and vocabulary
- Building rich accurate concept images, example use
- Connecting and mapping concepts, visualisation
- Active reading for mathematics, self-explanation
- Problem classification, structured problem solving
- Developing an internal monitor, raising metacognition
- Build approaches for processes e.g. diagrams, overlearning
- Mathematical writing skills, as appropriate to level...

Concrete: Manipulatives

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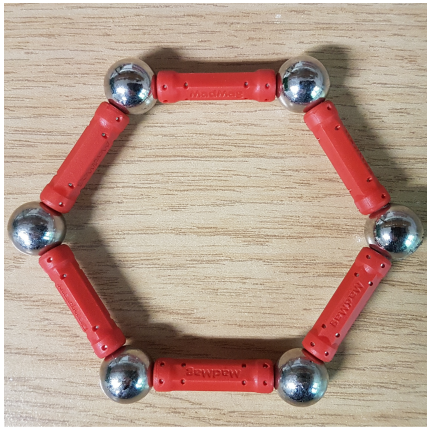

Concrete: Visualisation

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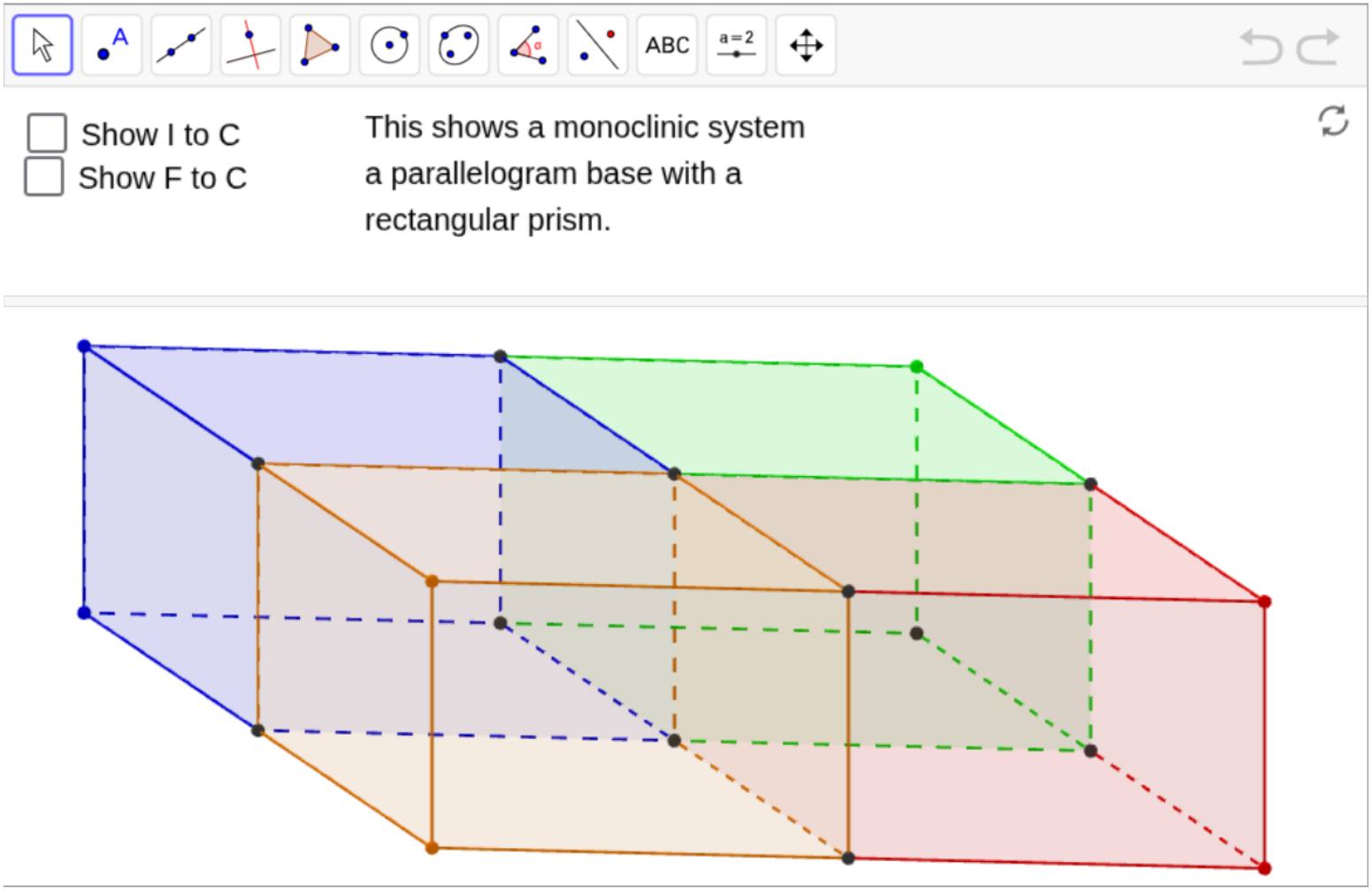

Processing: Flexible documents

Processing: Flexible documents

Definition (Composition of maps).
Suppose that $f : A \to B$ and $g : B \to C$ are maps. We can **compose** these maps to form a map $g \circ f : A \to C$ by

$$(g \circ f)(a) = g(f(a)) \quad \forall a \in A.$$

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Processing: Structured colour

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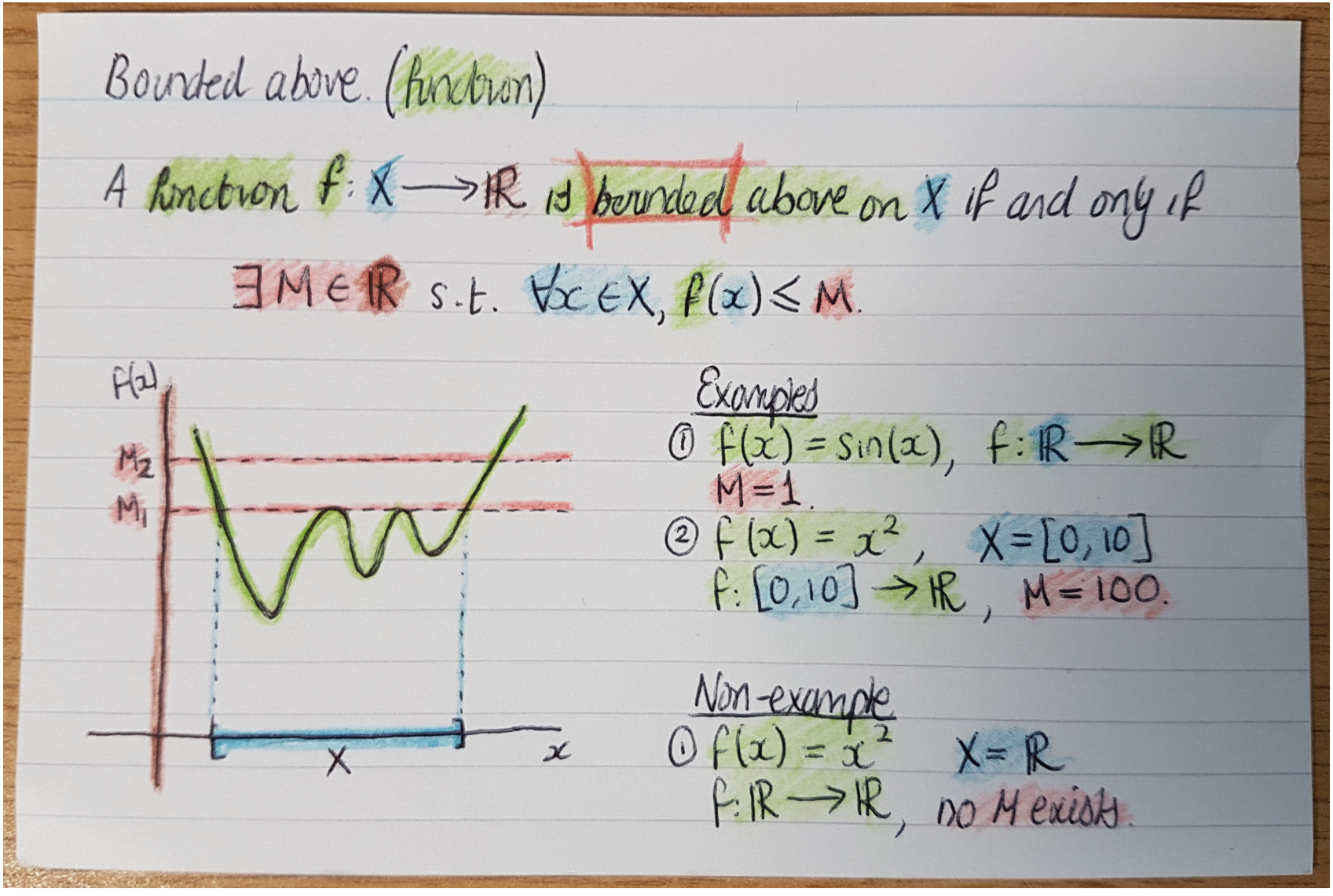
$$X_k = \frac{1}{N} \sum_{n=0}^{N-1} x_n e^{\mathrm{i} 2\pi k \frac{n}{N}}$$

To find the energy at a particular frequency, spin your signal around a circle at that frequency, and average a bunch of points along that path.[1]

[1] Specific example due to Stuart Riffle

Word recognition: Concept collation

Word recognition: Concept collation



Sequencing: Flow diagrams

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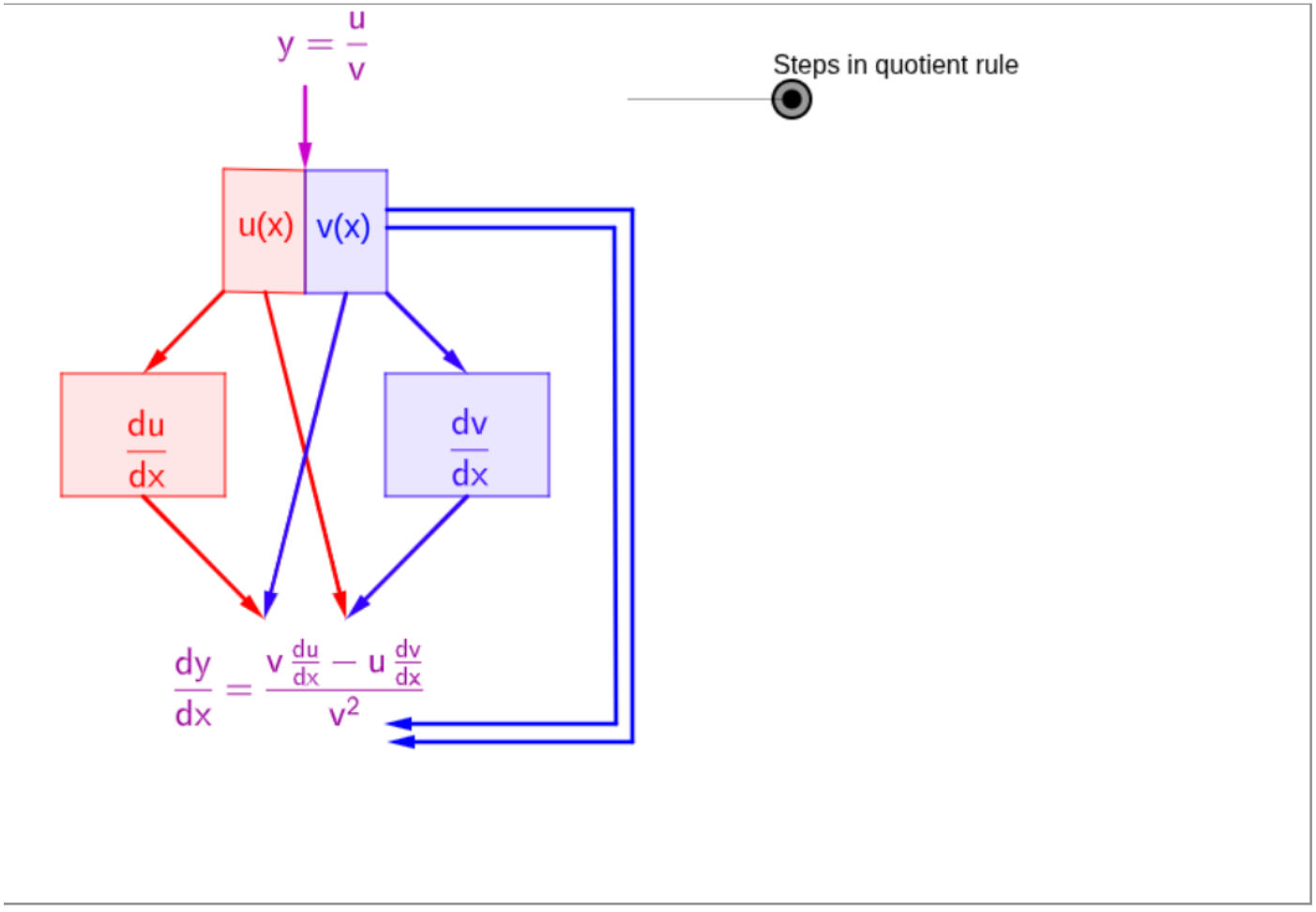
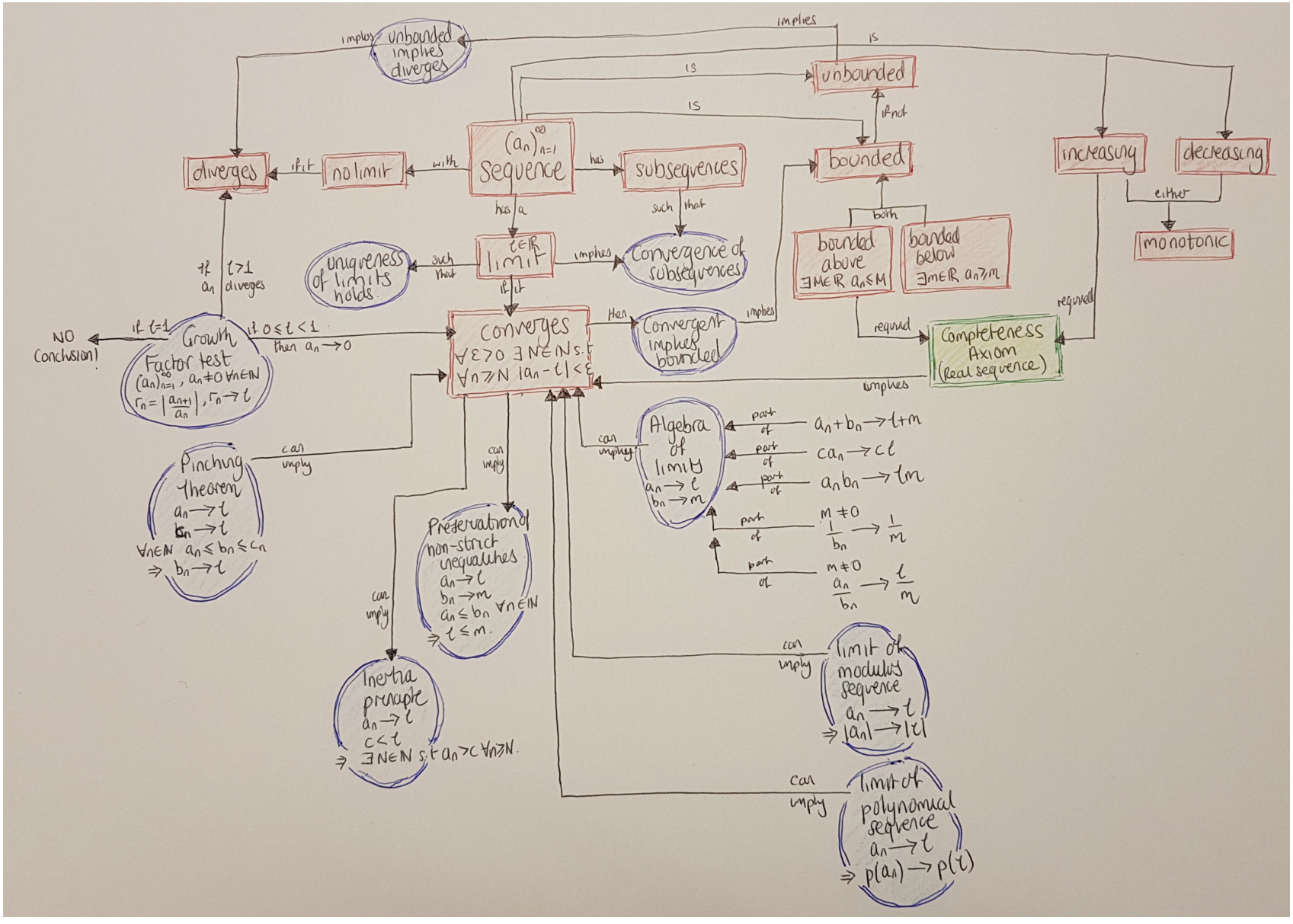


Structure: Concept mapping

Structure: Concept mapping



Overlearning: endless examples!

Overlearning: endless examples!

Question 22

Find the derivative of

$$y = \frac{\ln(x)}{2x^3}.$$

$\frac{dy}{dx} =$ [ ]

Unanswered

Save answer | **Unanswered** | Try another question like this one | Reveal answers

Writing: Effective equation entry

Writing: Effective equation entry

http://www.mathcentre.ac.uk/bathmash/Word/Writing%20equations%20in%20Word.mp4

Thanks!

Thanks!

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