

Note-taking for proof-based courses (typically math)

The paragraph-style format used to present axioms, definitions, theorems, etc. in textbooks can fail to illustrate formats that can be used to display information readably in student notes.

Type of entry	English prose	Visually navigable lists of short independent clauses and icons
Write the name of the entry and a number : Axiom # Postulated quantity # Definition # Lemma # Theorem # Corollary # Problem-solving tip #	Copy the paragraph-style entry from the textbook.	Convert the paragraph-style entry into lists of short independent clauses . Separate the clauses using line breaks . Use mathematical symbols when shorthand improves readability . Use simplified diagrams (especially for concepts that have geometric representations and for procedures that are more easily read as flowcharts).

The following example is adapted from Kolman, B. and Hill, D.R. *Elementary Linear Algebra* 8th ed. 2004. p. 154. Highlighting indicates where set braces in Kolman and Hill's text have been replaced with parentheses to emphasize the order in which vectors are listed. This notational convention is used in Axler, S. *Linear Algebra Done Right* 2nd ed. 1997.

Format of information from textbook	Format of re-expression of information that textbook failed to provide
<p>Definition 3.8</p> <p>The vectors $\vec{v}_1, \vec{v}_2, \dots, \vec{v}_k$ in a vector space V are said to span V if every vector in V is a linear combination of $\vec{v}_1, \vec{v}_2, \dots, \vec{v}_k$. Moreover, if $S = (\vec{v}_1, \vec{v}_2, \dots, \vec{v}_n)$, then we also say that the set S spans V, or that $(\vec{v}_1, \vec{v}_2, \dots, \vec{v}_n)$ spans V, or that V is spanned by S or, in the language of Section 3.3, $\text{span } S = V$.</p>	<div style="border: 1px solid black; padding: 10px; display: inline-block;"> <p>Context: Vector space V $S = (\vec{v}_1, \vec{v}_2, \dots, \vec{v}_n)$</p> <p>Feature of interest: $\forall \vec{u} \in V,$ $c_1 \vec{v}_1 + c_2 \vec{v}_2 + \dots + c_n \vec{v}_n = \vec{u}$for at least one set of $c_1, c_2, \dots, c_n \in \mathbb{R}$</p> </div> \Leftrightarrow <div style="border: 1px solid black; padding: 10px; display: inline-block; vertical-align: top;"> <p>Thesaurus</p> <p>The vectors $\vec{v}_1, \vec{v}_2, \dots, \vec{v}_k$ span V</p> <p>S spans V</p> <p>$(\vec{v}_1, \vec{v}_2, \dots, \vec{v}_n)$ spans V</p> <p>V is spanned by S</p> <p>$\text{span } S = V$.</p> </div>

Fair use justification: A. Purpose and character of use (Critique): It was **essential to copy** a passage from the textbook and to compare that passage side-by-side with a re-expression of the information in the passage so as to **illustrate that the original format of the copied text** used by the textbook **failed to show** students **how** the information in the copied **text could be translated into a readable format** in student notes. **B. Nature of copyrighted work (Educational):** Mathematical textbook. **C. Amount and substantiality of portion taken (Minimal):** The copied passage contains 74 words from a textbook containing 628 pages. **D. Effect of use upon the potential market: Negligible or slightly positive:** A traditional linear algebra textbook, like that of Kolman and Hill, has logically interlocking parts. Copying a single paragraph-length definition does not make accessible the totality of the interlocking logical content of the overall textbook. Citation might actually advertise the textbook to readers.

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Spatially arrange names of scenarios on a page to visually represent meanings of conditional and biconditional statements

	Conditional statements	Biconditional statements																		
English	<p>If [Hypotheses], then [Conclusion].</p> <p>[Hypotheses] imply that [Conclusion].</p> <p>[Hypotheses] are sufficient to guarantee that [Conclusion].</p> <p>[At least one hypothesis] needs [to fail to be satisfied] in order to allow for the possibility that [Conclusion does not hold].</p>	<p>[Clause A] if and only if [Clause B].</p> <p>[Clause A] is necessary for allowing and sufficient for guaranteeing that [Clause B].</p>																		
Symbol	Hypotheses \Rightarrow Conclusion	Clause A \Leftrightarrow Clause B																		
Contingency chart	<table border="1"> <thead> <tr> <th></th> <th>Hypotheses are all satisfied</th> <th>At least one hypothesis is not satisfied</th> </tr> </thead> <tbody> <tr> <th>Conclusion holds</th> <td></td> <td></td> </tr> <tr> <th>Conclusion does not hold</th> <td>Rejected</td> <td></td> </tr> </tbody> </table>		Hypotheses are all satisfied	At least one hypothesis is not satisfied	Conclusion holds			Conclusion does not hold	Rejected		<table border="1"> <thead> <tr> <th></th> <th>Clause A holds</th> <th>Clause A does not hold</th> </tr> </thead> <tbody> <tr> <th>Clause B holds</th> <td></td> <td>Rejected</td> </tr> <tr> <th>Clause B does not hold</th> <td>Rejected</td> <td></td> </tr> </tbody> </table>		Clause A holds	Clause A does not hold	Clause B holds		Rejected	Clause B does not hold	Rejected	
	Hypotheses are all satisfied	At least one hypothesis is not satisfied																		
Conclusion holds																				
Conclusion does not hold	Rejected																			
	Clause A holds	Clause A does not hold																		
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