Generate a comprehensive lecture scribe for Lecture 3 based solely on the attached material. This scribe is intended as reference material for a closed notes exam. For every definition, theorem, derivation, and worked example, you must reason through the logic step-by-step within the text. Make the logical dependencies between concepts explicit so a student can reconstruct the proofs independently. Do not include any information, examples, analogies, or intuition not explicitly present in the provided PDF. Include all formal notation, assumptions, and mathematical conditions exactly as they appear in the source. Maintain a formal, academic tone and start the response immediately with the scribe content, do not include personal AI comments or greetings. Do not include any information, examples, analogies, or intuition not explicitly present in the provided PDF. Include all formal notation, assumptions, and mathematical conditions exactly as they appear in the source. If the lecture presents a conceptual flow rather than mathematical proofs, reason through the logical dependencies of those concepts to make the structure explicit for a student. Maintain a formal, academic tone and start the response immediately with the scribe content, do not include personal AI comments or greetings.