

Generate a formal, technical lecture scribe for Lecture 11:

Transformation of Random Variables, based exclusively on the attached PDF. This scribe is intended as a primary study guide for a closed notes exam. Step-by-step, reason through the process of finding the PDF of a new random variable  $Y = g(X)$ . Explicitly explain the dependency on the derivative  $|dy/dx|$  as presented in the material. For the section on "Function of Two Random Variables" (e.g.,  $Z = X + Y$ ), reason through the logical steps required to derive the joint transformation. Ensure every step of the derivation for  $Z = X + Y$  is explicitly shown, making the logical flow between the original PDFs and the resulting PDF clear. Reconstruct the example of the Uniformly Distributed RV (range -1 to 1) and its transformation  $Y = \sin(\pi X / 2)$ . Reason through every substitution and mathematical transformation line-by-line. Ensure every step of the derivation for  $Z = X + Y$  is explicitly shown, making the logical flow between the original PDFs and the resulting PDF clear. Use only the provided PDF. Do not introduce outside transformation methods, alternative notation, or generic probability examples. If a specific derivation step is not in the PDF, do not invent it; however, do explain the logic of the steps that are there. Maintain a formal academic tone. Start the response immediately with the scribe content. Do not include any personal AI greetings or helpful commentary. Structure the scribe using headings that follow the lecture outline: 1. Transformation of One RV, 2. Function of Two RVs, 3. Illustrative Examples.