Diffusion equations and entropy inequalities

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Many classical inequalities can be obtained by looking at the monotonicity in time of convex functionals evaluated on solutions to linear and nonlinear diffusion equations. Among them, the classical Young's inequality and its converse in sharp form, Brascamp-Lieb type inequalities, Babenko's inequality and Prékopa-Leindler inequality as well as the Shannon's entropy power inequality. In these lectures we aim to give a self-contained presentation of this subject.