A characterization of the Radon-Nikodym property

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A Banach space X has the Radon-Nikodym property if each Borel measure on $[0,1]$ with values in X which is absolutly continuous with respect to the Lebesgue measure has a density. This property can be characterized with convergence of matingales, with perturbed optimization of real valued, lower semi continuous and bounded below functions defined on X, with differentiability of functions defined on the real line with values in X, or with a geometrical property. We show here that a Banach space has Radon-Nikodym property if and only if it satisfies a suitable extension of the fact that a bounded below sequence of real numbers converges. We shall also see how this result can be used to obtain the construction of differentiable functions that are solutions almost everywhere of some Hamilton-Jacobi equation.

Joint work with Oscar Madiedo.