Siqi He* (she@scgp.stonybrook.edu), State University of New York, Stony brook, NY 11794, and Rafe Mazzeo (rmazzeo@stanford.edu), Department of Mathematics, Stanford University, Stanford, CA 94305. Kapustin-Witten equations with Nahm pole boundary condition.

We will discuss Witten’s gauge theory approach to Jones polynomial by counting solutions to the Kapustin-Witten (KW) equations with singular boundary conditions over 4-manifolds. We will give a classification of solutions to the KW equations over $S^1 \times \Sigma \times \mathbb{R}^+$. We prove that all solutions to the KW equations over $S^1 \times \Sigma \times \mathbb{R}^+$ are $S^1$ direction invariant and we give a classification of the KW monopole over $\Sigma \times \mathbb{R}^+$ based on the Hermitian-Yang-Mills type structure of KW monopole equation. This is based on joint works with Rafe Mazzeo. (Received August 01, 2019)