Homework Assignments #9 for 18.952

Due Friday, May 6

This assignment will consist of one problem: I want you to prove DeRham's theorem, i.e., prove that if M is a connected n-dimensional manifold with "finite topology" and $\mathbb{U} = \{U_1, \ldots, U_N\}$ is a good cover

$$H^k_{DR}(M) \cong \check{H}^k(\mathbb{U}, \mathbb{R}) .$$

Hint: Some strenuous diagram-chasing using the attached diagram.

The Weyl diagram

Here $C^{k,\ell} = \check{C}^k(\mathbb{U}, \Omega^\ell)$ and $\check{C}^k = \check{C}^k(\mathbb{U}, \mathbb{R})$.

The vertical arrows are d's and the horizontal arrows are δ's. All columns are exact except the left-hand column which is the usual DeRham complex and all rows are exact except the bottom one which is the usual Cech complex. All arrows commute.