(a) Consider the Rouquier complex

$$F_{s_i}: \ldots \to 0 \to R(1) \to B_{s_i} \to 0 \to \ldots$$
.

Show that the tensor product $F_{s_i} \otimes_R F_{s_i}$ is homotopy equivalent to a complex of the form

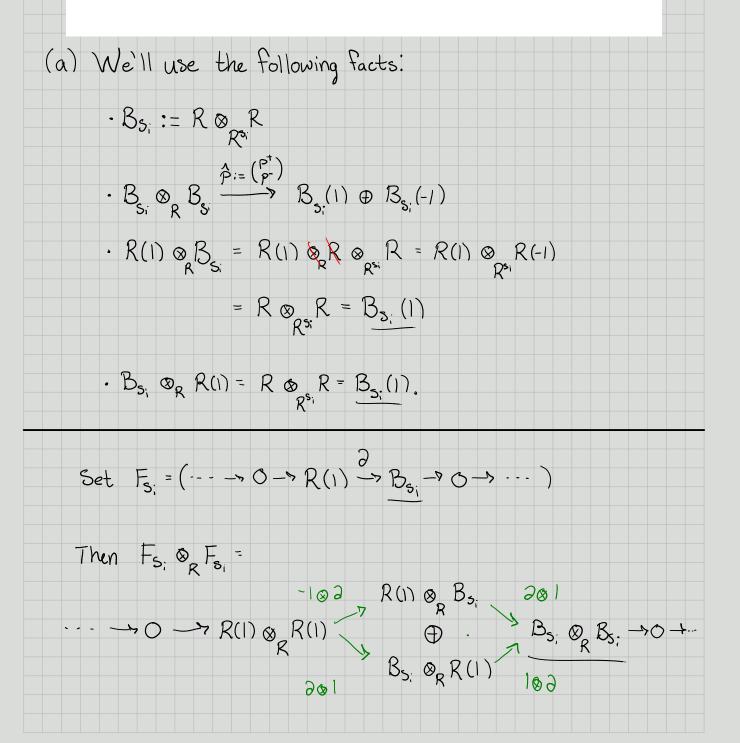
$$\ldots \to 0 \to R(2) \to B_{s_i}(1) \to B_{s_i}(-1) \to 0 \to \ldots$$

Remember to keep track of (at least some of) the differentials to justify each use of Gaussian elimination.

(b) Part (a) can be viewed as a categorification of the equation

$$H_{s_i}^2 = v^{-1}C_{s_i} - vC_{s_i} + v^2$$
 (1)

in the Hecke algebra. Show that (1) is the quadratic relation.



$$= (\cdot \cdot \cdot \cdot \cdot) - \gamma R(2) \xrightarrow{p} B_{5}, (1) \xrightarrow{p$$