Homework for July 25

1. Prove this step from Lecture 17, Page 19:

$$\sum_{i=0,1} f_{ii} = \sum_{i=0,1} \overrightarrow{\left(\frac{\partial}{\partial c^*}\right)^i} \tilde{f}(c^*, c) \overleftarrow{\left(\frac{\partial}{\partial c}\right)^i} \Bigg|_{c=c^*=0}$$
$$= \int dc dc^* (1 + c^* c) \tilde{f}(c^*, c)$$

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2. Prove this step from Lecture 17, Page 19:

$$\sum_{j=0,1} \tilde{f}'(c'^*, c') \overleftarrow{\left(\frac{\partial}{\partial c'}\right)^j} \overrightarrow{\left(\frac{\partial}{\partial c^*}\right)^j} \tilde{f}(c^*, c)\bigg|_{c^*=c'=0}$$

$$= (-1) \int dc' dc^* \tilde{f}'(c'^*, c')(1 - c^* c') \tilde{f}(c^*, c)$$

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3. Show what equivalent expression we get in the transfer matrix operator formalism if we take periodic boundary conditions in time:

$$c(L_t) = +c(0)$$

$$\int DcDc^* \exp\left\{\sum_{n_t=0}^{L_t-1} \sum_{\vec{n},i} c^*(n_t)\left[c(n_t) - c(n_t+1)\right]\right\}$$
$$\times f_{L_t-1}\left[c^*(L_t-1), c(L_t-1)\right] \cdots f_0\left[c^*(0), c(0)\right] = ?$$