

Lecture 0 — October

*Lecturer: Anant Sahai and David Tse**Scribe: For you to do*

0.1 Homework 1

Theorem 0.1. *If $g(\alpha_1, \alpha_2, \dots, \alpha_k)$ is a polynomial in α 's with coefficients not all zero from a field F , then if we restrict α 's to come from a subset $|E'|$ of F s.t.*

$$|E'| > \max \text{degree of } \alpha \text{'s in } g$$

there exists α^ such that $g(\alpha^*)$ is not the zero polynomial.*

1. Prove theorem 0.1.
2. Show that if the underlying field is of size L , then randomly choosing memoryless network coding matrices will succeed with $P = (\text{fill this in})$ even for cyclic networks.
3. Show that $P \rightarrow 1$ as $L \rightarrow \infty$.
4. Comment on the difference between DAG and cyclic cases.
- 4a. Would you ever want to use a network code with memory?
5. Find the bug in Raymond Yeung's proof in 11.5.1 of the first edition of his book.