

**MATH 56A: STOCHASTIC PROCESSES  
PRACTICE QUIZ**

**Problem 1** Consider the countable Markov chain with state space

$$S = \{0, 1, 2, 3, \dots\}$$

and probabilities  $p(n, n+1) = n/(n+1), p(n, n-1) = 1/(n+1)$ .

- a) Determine if this chain is transient or recurrent.
- b) What is the statement of the theorem you are using? (You might want to prepare this kind of answer in advance.)
- c) If recurrent determine if it is positive recurrent or null recurrent. What is the formula you are using?

**Problem 2** Consider the birth-death problem with

$$\lambda_n = np^n = \text{birth rate when population is } n$$

and no deaths.

For which values of  $p$  will there be an explosion?