

Name:

Recitation Section:

### Math 2802 N1-N3 Quiz

#### Solutions

The quiz has a total of 10 points and you have 15 minutes. Read carefully and clearly justify how you obtained your answers.

1. [- points] Write the definition of *Steady-vector of a stochastic matrix*  $P$ ; and find two distinct steady-state vectors for  $P = \begin{pmatrix} 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \end{pmatrix}$

#### Solution.

A steady-state vector  $v$  of a stochastic matrix  $A$  has entries summing to one and satisfies  $Av = v$ .

Two steady-state vectors for  $P$  are  $\begin{pmatrix} 1/2 \\ 0 \\ 1/2 \end{pmatrix}$  and  $\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ .

2. [-pts] Answer true or false
- If  $\lambda = 1$  is an eigenvalue of a stochastic matrix  $P$ , then  $P$  is regular.
  - If  $Pq = q$  for the transition matrix of a markov chain, then the entries in  $q$  are interpreted as occupation times of the sates in the long run.
  - If  $C$  is the compsumtion matrix for an economy with final demand  $d$  then the production vector can be computed using  $x = (C - I)^{-1}d$ .

#### Solution.

- False.** All stochastic matrices have  $\lambda = 1$  as eigenvalue.
- False.** This is only true if  $P$  is a regular stochastic matrix.
- False.** The inverse should be for matrix  $(I - C)$ .