## Problem 1

### 1.a.

Transition probability matrix:

[[ 0.5 0.5 0. ]

[ 0.25 0.5 0.25]

[ 0. 0.5 0.5 ]]

Transition probabilities after 2 steps

[[ 0.375 0.5 0.125]

[ 0.25 0.5 0.25 ]

[ 0.125 0.5 0.375]]

Transition probabilities after 5 steps

[[ 0.26562 0.5 0.23438]

[ 0.25 0.5 0.25 ]

[ 0.23438 0.5 0.26562]]

Transition probabilities after 10 steps

[[ 0.25049 0.5 0.24951]

[ 0.25 0.5 0.25 ]

[ 0.24951 0.5 0.25049]]

Transition probabilities after 25 steps

[[ 0.25 0.5 0.25]

[ 0.25 0.5 0.25]

[ 0.25 0.5 0.25]]

### 1.b.

Transition probability matrix with absorbing states:

[[ 1. 0. 0. ]

[ 0.25 0.5 0.25]

[ 0. 0. 1. ]]

Transition probabilities after 2 steps

[[ 1. 0. 0. ]

[ 0.375 0.25 0.375]

[ 0. 0. 1. ]]

Transition probabilities after 5 steps

[[ 1. 0. 0. ]

[ 0.48438 0.03125 0.48438]

[ 0. 0. 1. ]]

Transition probabilities after 10 steps

[[ 1. 0. 0. ]

[ 0.49951 0.00098 0.49951]

[ 0. 0. 1. ]]

Transition probabilities after 25 steps

[[ 1. 0. 0. ]

[ 0.5 0. 0.5]

[ 0. 0. 1. ]]

### 1.c.

Transition probability matrix:

[[ 1. 0. 0. 0. 0. ]

[ 0.25 0.5 0.25 0. 0. ]

[ 0. 0.25 0.5 0.25 0. ]

[ 0. 0. 0.25 0.5 0.25]

[ 0. 0. 0. 0.5 0.5 ]]

Transition probabilities after 84 iterations:

[[ 1. 0. 0. 0. 0. ]

[ 0.98153 0.00281 0.0052 0.00679 0.00367]

[ 0.96587 0.0052 0.0096 0.01255 0.00679]

[ 0.9554 0.00679 0.01255 0.01639 0.00887]

[ 0.95173 0.00735 0.01358 0.01774 0.0096 ]]

Transition probabilities after 125 iterations:

[[ 1. 0. 0. 0. 0. ]

[ 0.99624 0.00057 0.00106 0.00138 0.00075]

[ 0.99305 0.00106 0.00196 0.00256 0.00138]

[ 0.99091 0.00138 0.00256 0.00334 0.00181]

[ 0.99017 0.0015 0.00277 0.00361 0.00196]]