**Problem 1.**

Define the fundamental matrix:

Thus,

According to Lemma 2.1(i):

**Problem 2.**

According to Lemma 2.3:

**Problem 3.**

1. State space: – 1-L, 2-H

Control space: – 0-do not receive catalog, 1-receive catalog

Transition probabilities:

Another way to write the transition probabilities is the following:

The cost function is:

Dynamic programming equations is:

i.e.

1. , is the solution of the system of equations:

Setting , so

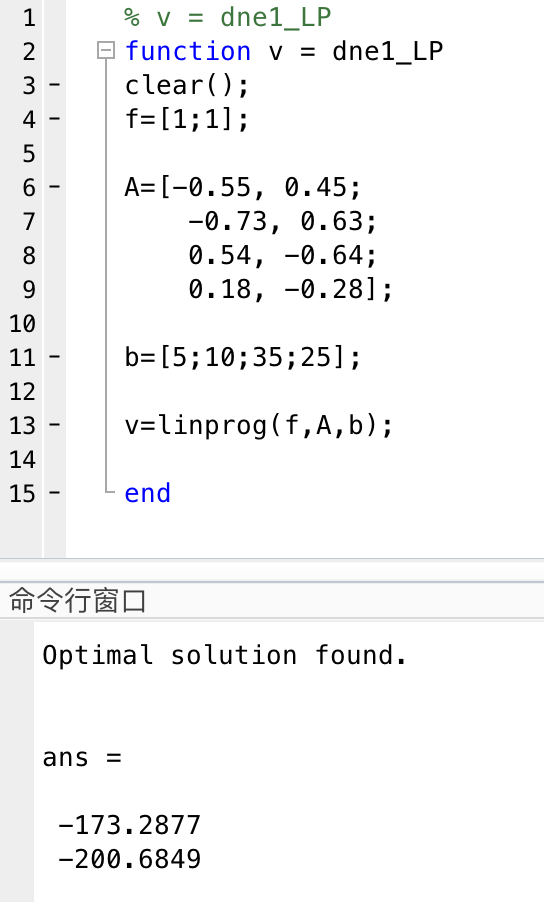
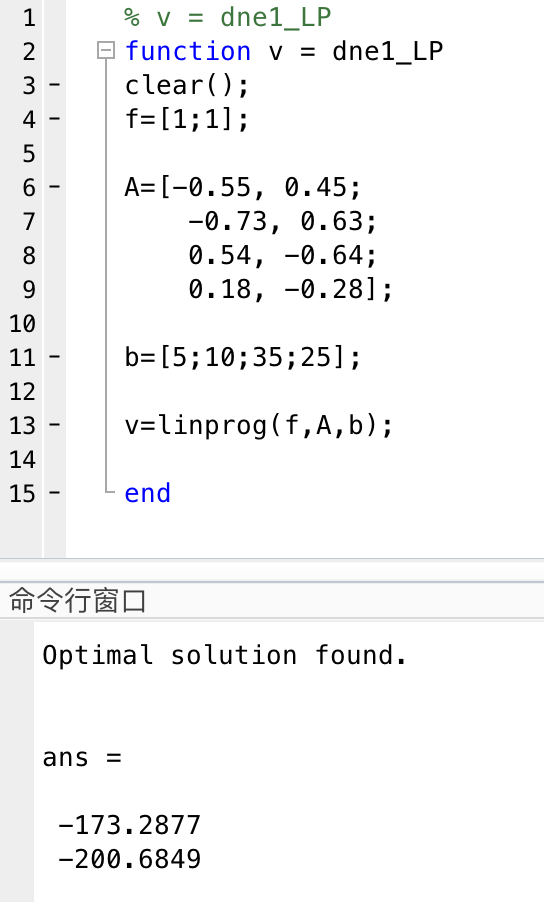
The equation becomes

The policy maximize is , is the solution of the system of equations:

So

As

The policy maximize is .



1. if discount factor is 1, the discounted infinite-horizon problem equivalent to the average reward problem.