SOLUTIONS FOR HOMEWORK 4

15.1-2

Consider the case $n = 3$ with the following price table

Length i	1	2	3
Price p_i	1	10	12
Density d_i	1	5	4

The greedy strategy will give $p_1 + p_2 = 11$, however our optimal solution is $p_3 = 12$.

15.1-3

Use the similar notations as our textbook, we have

$$r_n = \max_{1 \le i \le n} (p_i - c + r_{n-i})$$

and we have boundary condition $r_0 = 0$ (**this is important and you will lose points if you do not explicitly write it down**).

We also give the Pseudocode as Algorithm 1.

15.2-1

(Table omitted) The optimal parenthesization is $(A_1A_2)((A_3A_4)(A_5A_6))$, with the minimum number of scalar multiplication 2010.

15.2-2

We borrow the implementation of MATRIX-MULTIPLY from our textbook, pages 371. Pseudocode is presented by Algorithm 2.

Algorithm 1: ROD-CUT(p, n, c)

```
r_0 ← 0
for i = 1 to n do
    r_i ← p_i
    for j = 1 to i − 1 do
        r_i ← max{r_i, p_j − c + r_{i−j}}
return r_n
```

Algorithm 2: MATRIX-CHAIN-MULTIPLY(A, s, i, j)

```
if i == j then
    return A_i
else
    c ← s[i, j]
    M ← MATRIX-CHAIN-MULTIPLY(A, s, i, c)
    N ← MATRIX-CHAIN-MULTIPLY(A, s, c + 1, j)
    return MAXTRIX-MULTIPLY(M, N)
```