exercise sheet 11

Question 11.1

BOTTOM - UP - CUT - ROD (p, n)

1: Let $r[0 \ldots n]$ be a new array
2: $r[0] = 0$
3: for $j = 1$ to n do
4:     $q = p[j]$
5:     for $i = 1$ to $j-1$ do
6:         $q = \max(q, p[i] + r[j-i] - c)$
7:     $r[j] = q$
8: return $r[n]$

Question 11.2

MEMOIZED - CUT - ROD (p, n)

1: let $r[0:n], s[0:n]$ be new arrays
2: for $i = 0$ to n do
3:     $r[i] = -\infty$
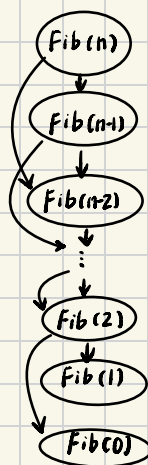4: return MEMOIZED - CUT - ROD - AUX (p, n, r, s)

MEMOIZED - CUT - ROD - AUX (p, n, r, s)

1: if $r[n] \geqslant 0$
2:     return $r[n]$
3: if $n == 0$
4:     $q = 0$, $s[n] = 0$
5: else $q = -\infty$
6:     $s = 0$
7:     for $i = 1$ to n do
8:         if $q < p[i] + $ MEMOIZED-CUT-ROD-AUX$(p, n-i, r, s)$
9:         then $q = p[i] + $ MEMOIZED-CUT-ROD-AUX$(p, n-i, r, s)$
10:         $s[n] = i$
11: $r[n] = q$
12: return $r[n]$

Question 11.3
  BOTTOM-UP-Fib (n)
1: let f[0:n] be a new array
2: f[0]=1, f[1]=1
3: for i=2 to n do
4:     f[n] = f[n-1]+f[n-2]
5: return f[n]

Fib(n)

Fib(n-1)

Fib(n-2)

⋮

Fib(2)

Fib(1)

Fib(0)

vertices: n+1
edges: 2n-2

Question 11.4
(1)
  BOTTOM-UP (a, n)
1: let A[0:n], B[0:n] be new arrays.
2: A[0]=0, B[0]=0
3: for i=1 to n do
4:     B[i] = max (B[i-1]+a[i], a[i])
5:     A[i] = max (B[i], A[i-1])
6: return A[n]

(2) line 1 and 2 take O(1)

line 3, 4, 5 take O(n)
line 6 take O(1)
⟹ total runtime take O(n)