9/5/2007

Suppose there is setup cost $g(x', x)$ $\underline{|x'| x|}$

$$f_r(i, x') = \min_x \left\{ c(x) + g(x', x) + f_{r+1}(i + x - d_r, x) \right\}$$

Now we have to compute f_r over all i & x'.

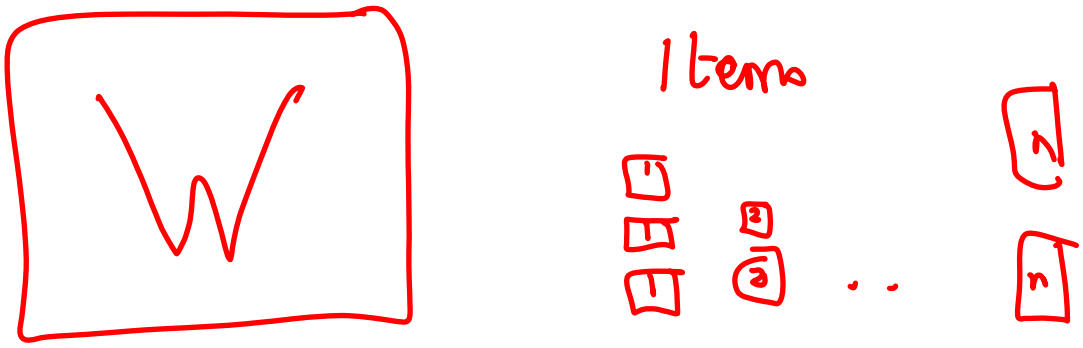
Knapsack Problem

Simple integer program:

$$\text{maximize} \quad \sum_{j=1}^{n} c_j x_j$$

$$\text{s.t.} \quad \sum_{j=1}^{n} w_j x_j \leq W$$

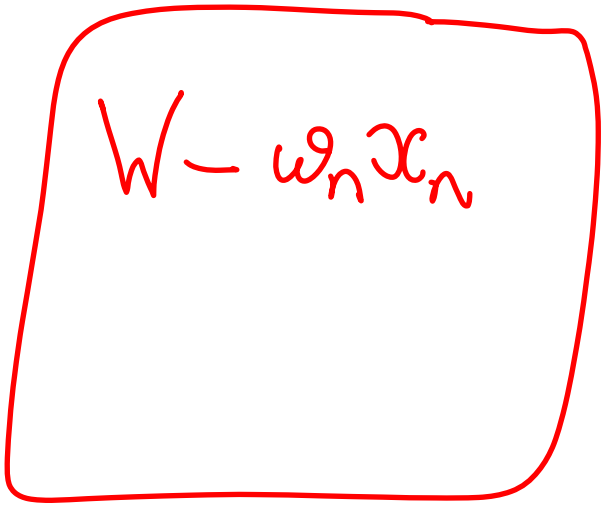
$$x_j \geq 0 \text{ \& integer.}$$



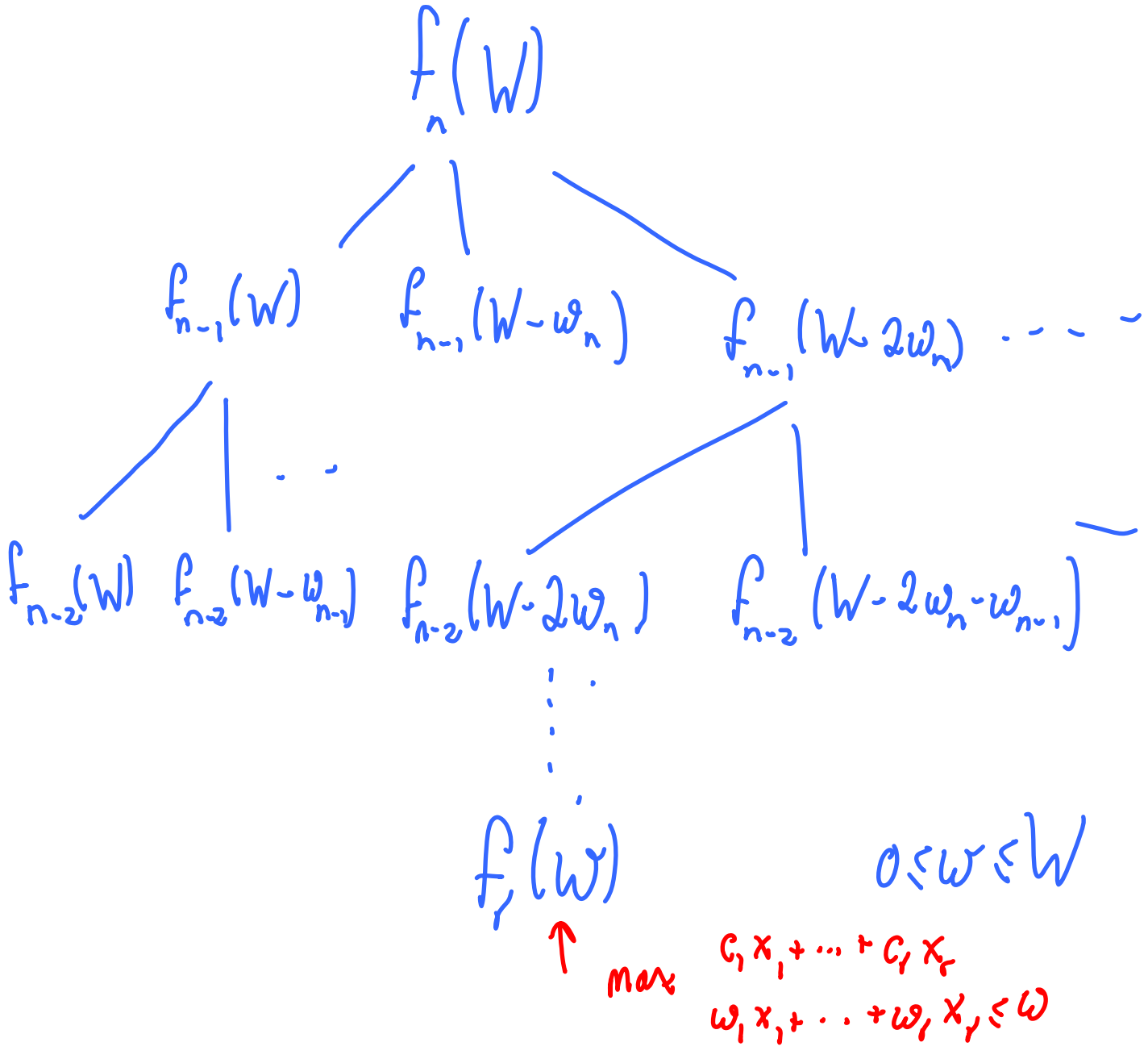
Suppose I decide to put x_n of item n into knapsack.

Remaining problem:

$$f_n(W) = \max_{x_n} \left[c_n x_n + f_{n-1}(W - w_n x_n) \right]$$



$n-1$ types of item to choose from.


$f_n(W)$
$f_{n-1}(W)$
$f_{n-1}(W-w_n)$
$f_{n-1}(W-2w_n)$
$f_{n-2}(W)$
$f_{n-2}(W-w_{n-1})$
$f_{n-2}(W-2w_n)$
$f_{n-2}(W-2w_n-w_{n-1})$
$f_r(w)$
$0 \le w \le W$
$\max \; c_1x_1+\cdots+c_rx_r$
$w_1x_1+\cdots+w_rx_r \le w$

$$f_r(w) = \max_{0 \le x \le \frac{w}{w_r}} \left[c_r x + f_{r-1}(w - w_r x) \right]$$

#items of type r

Maximiza: $2x_1 + 5x_2 + 9x_3 + 16x_4$

$$x_1 + 2x_2 + 3x_3 + 5x_4 \leq 8$$

r	1		2		3		4	
w	x_1	f_1	x_2	f_2	x_3	f_3	y_4	f_4
0	0	0	0	0				
1	1	2	0	2				
2	2	4	1	5				
3	3	6	1	7				
4	4	8	2	10				
5	5	10	2	12				
6	6	12	3	15				
7	7	14	3	17				
8	8	16	4	20	2	23		