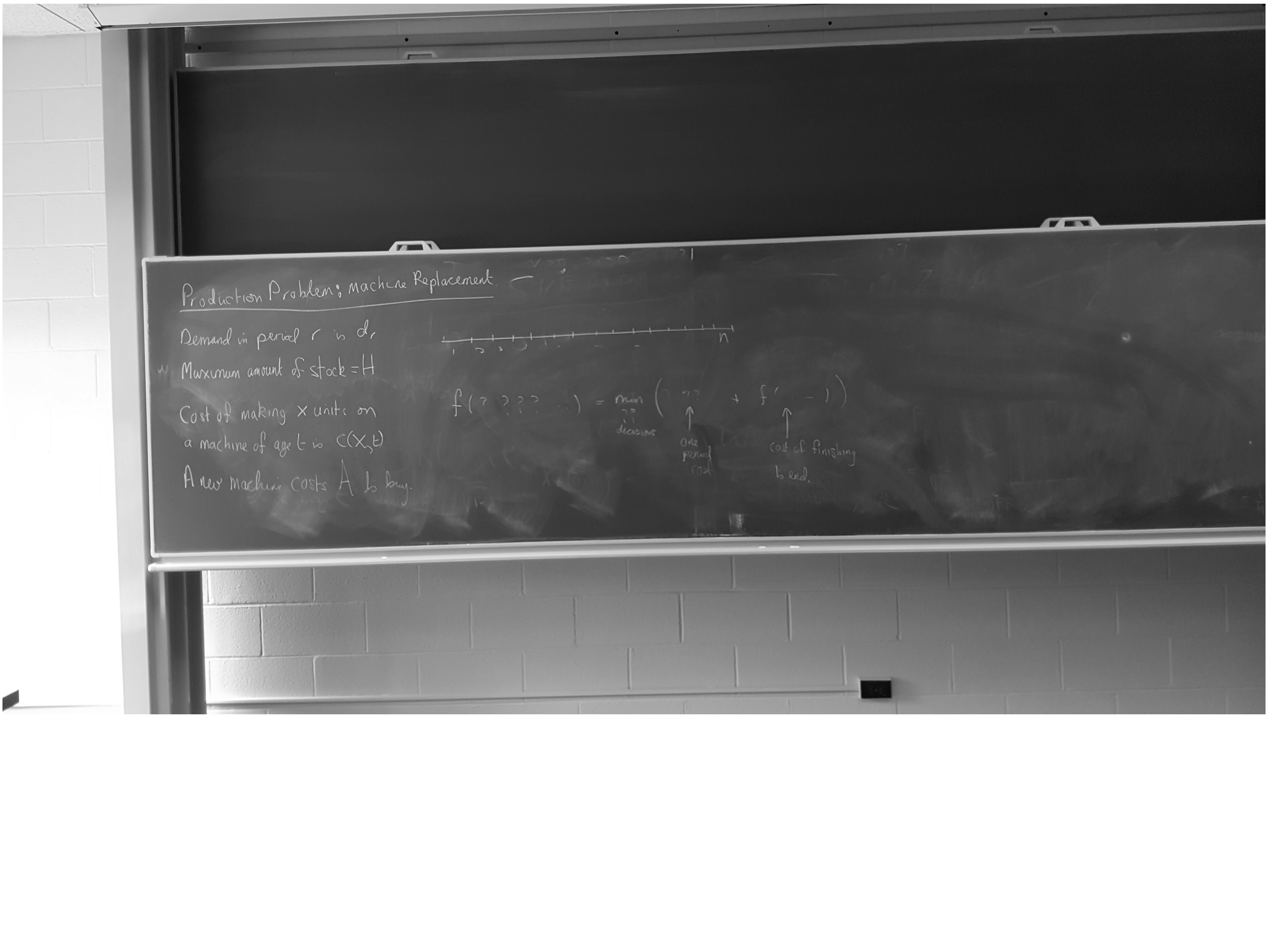

Production Problem: machine Replacement
Demand in period r is d_r
Maximum amount of stock = H
Cost of making x units on
a machine of age t is C(X, t)
A new machine costs A to buy.
1 2 3
n
f(? ???) = min(?? + f(-))
decisions
one period cost
cost of finishing to end.

Production Problem: machine Replacement

Demand in period r is d_r

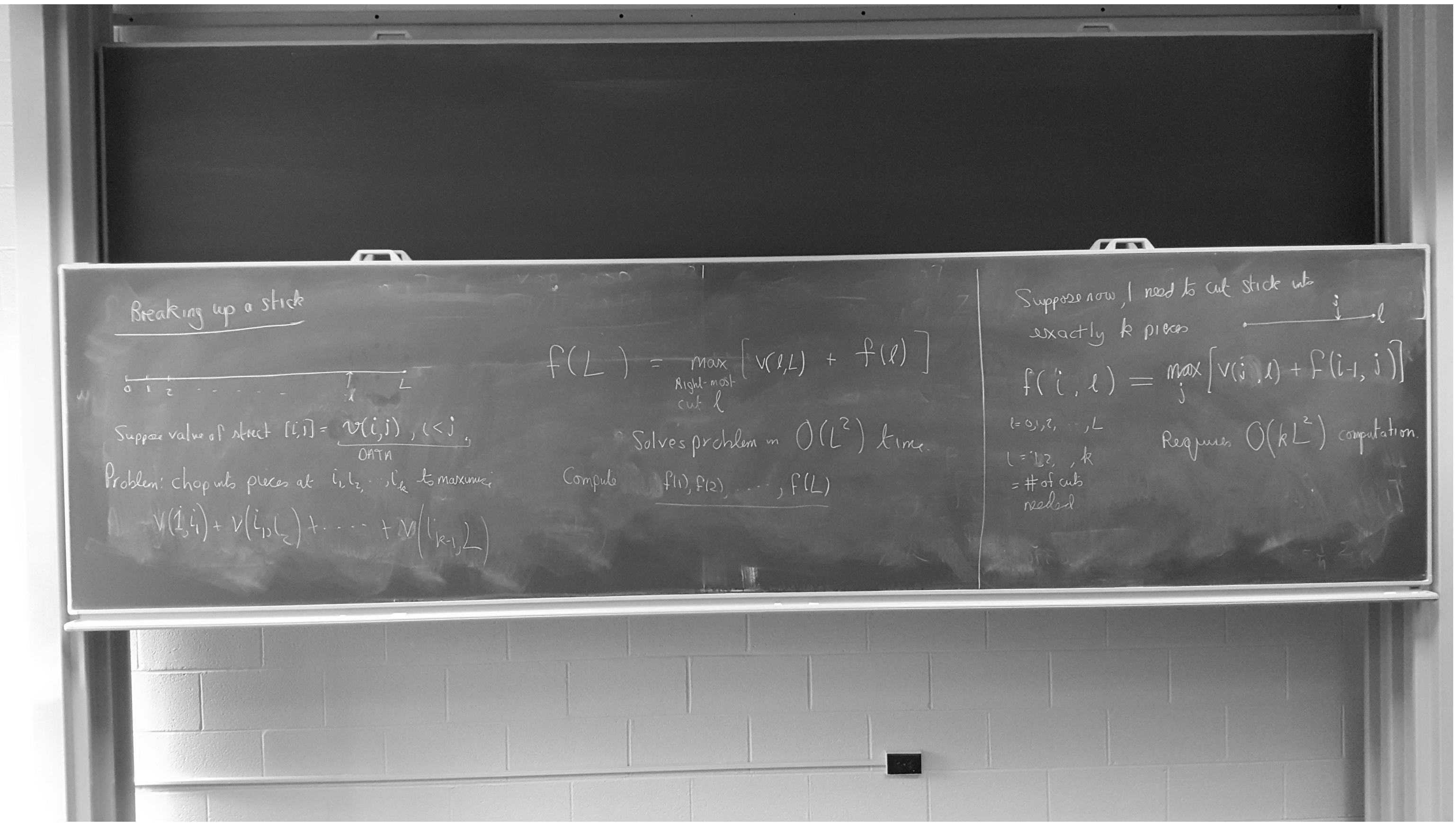
Maximum amount of stock $= H$

Cost of making x units on a machine of age t is $C(x,t)$

A new machine costs A to buy.

$1 \quad 2 \quad 3 \quad \ldots \quad n$

$$f(\underset{\text{current period}}{r}, \underset{\text{current stock}}{h}, \underset{\text{age of machine}}{t}) = \min \begin{cases} \text{not Replace} & \min\limits_{x} \left[C(x,t) + f(r+1, h+x-d_r, t+1) \right] \\ \text{Replace} & \min\limits_{x} \left[A + C(x,0) + f(r+1, h+x-d_r, 1) \right] \end{cases}$$


Breaking up a stick
0 1 2 - - - - - - ℓ L
Suppose value of stick $[i,j]$ = $\underbrace{v(i,j)\ ,\ i<j}_{\text{DATA}}$
Problem: chop into pieces at $i_1, i_2, \ldots, i_k$ to maximize
$v(1, i_1) + v(i_1, i_2) + \cdots + v(i_{k-1}, L)$
$f(L) = \max_{\substack{\text{Right-most} \\ \text{cut } \ell}} \left[v(\ell, L) + f(\ell) \right]$
Solves problem in $O(L^2)$ time.
Compute $f(1), f(2), \ldots, f(L)$
Suppose now, I need to cut stick into exactly k pieces
j ℓ
$f(i, \ell) = \max_j \left[v(j, \ell) + f(i-1, j) \right]$
$\ell = 0, 1, 2, \ldots, L$
$i = 1, 2, \ldots, k$
= # of cuts needed
Requires $O(kL^2)$ computation.