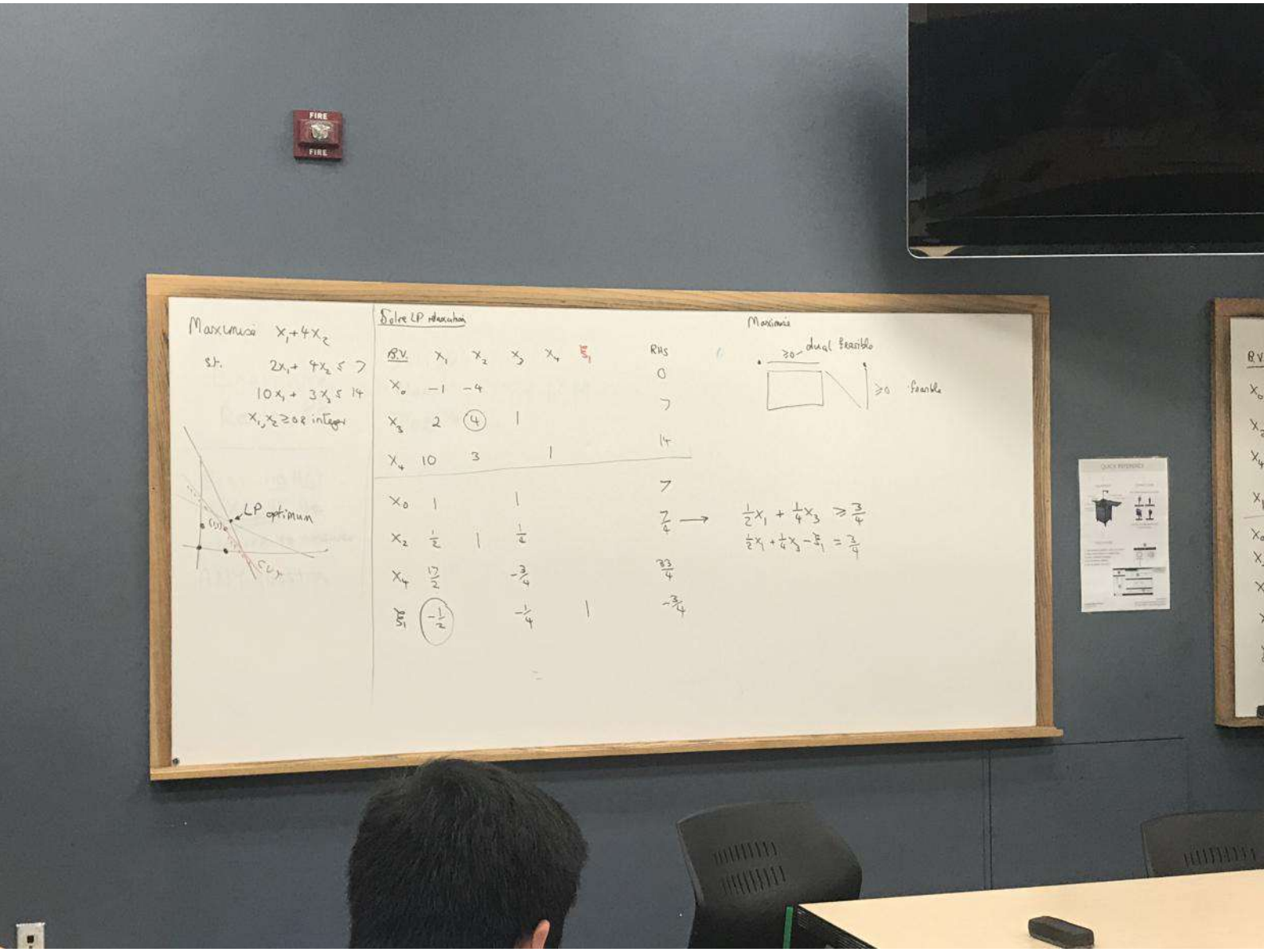
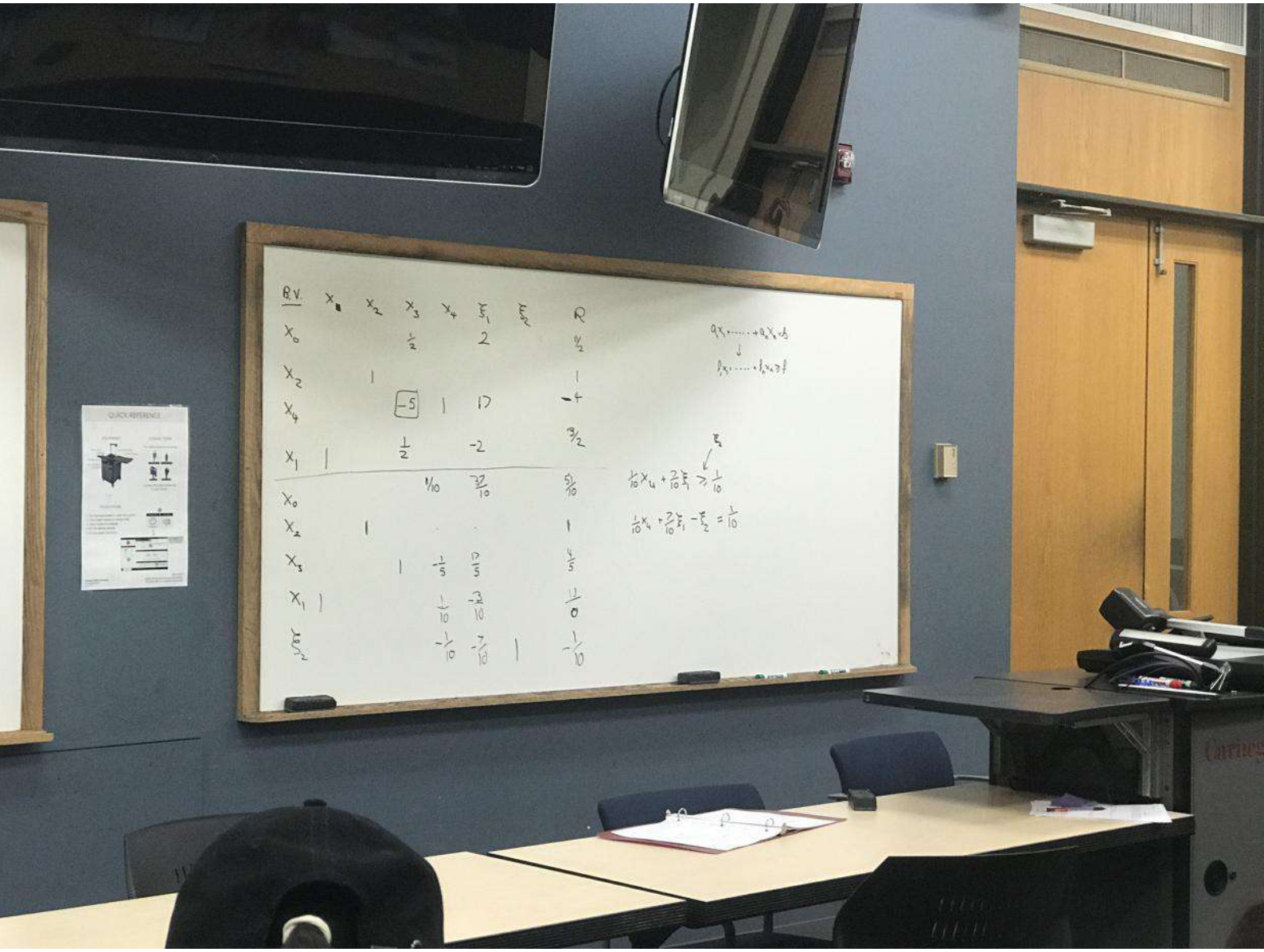

FIRE
FIRE
Max Lmuca $x_1+4x_2$
s.t. $2x_1+4x_2 \le 7$
$10x_1+3x_2 \le 14$
$x_1, x_2 \ge 0$ & integer
LP optimum
Solve LP relaxation
BV $x_1$ $x_2$ $x_3$ $x_4$ RHS
$x_0$ −1 −4 0
$x_3$ 2 4 1 7
$x_4$ 10 3 1 14
$x_0$ 1 1 7
$x_2$ 1/2 1 1/4 7/4
$x_4$ 17/2 −3/4 33/4
BV −1/2 −1/4 −3/4
Maximize
≥0 dual feasible
≥0 feasible
$\frac{1}{2}x_1 + \frac{1}{4}x_3 \ge \frac{3}{4}$
$\frac{1}{2}x_1 + \frac{1}{4}x_3 - x_5 = \frac{3}{4}$


RV
R
$\frac{1}{10}x_4 + \frac{2}{10}\xi_1 \geq \frac{1}{10}$
$\frac{1}{10}x_4 + \frac{2}{10}\xi_1 - \xi_2 = \frac{1}{10}$

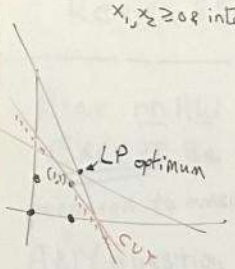
FIRE
FIRE

Maximise $x_1 + 4x_2$

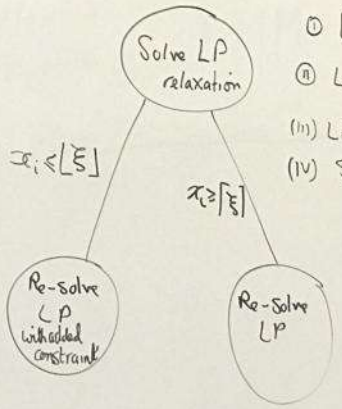
s.t. $2x_1 + 4x_2 \leq 7$

$10x_1 + 3x_2 \leq 14$

$x_1, x_2 \geq 0$ & integer




# Branch and bound




① LP solution is integer ✓

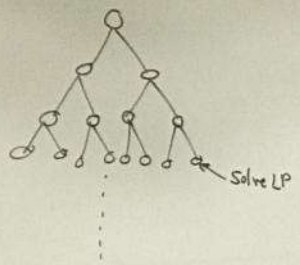
② LP is infeasible – stop

(III) LP is unbounded ??

(IV) Some basic variable is non-integer

$x_i = \xi$

Binary tree of problems




Carry around some known feasible solution to original constraints.

Value $= v^*$

(i) LP value $\leq v^*$ — problem over.

(ii) LP $> v^*$ and solution is integer — update $v^*$

(iii) LP is infeasible — problem over

(iv) LP $> v^*$ and there is a fractional solution — branch

(I) ?? which sub-problem to solve first

(II) ?? Which fractional variable to branch on.