Question #5

i - day visited mountain

W_i - Mountain Washington

A_i - Mountain Adams

J_i - Mountain Jefferson

$W \rightarrow J$ - $6+6+3 = 15$

$A \rightarrow J = 5+5+2 = 12$

$J \rightarrow W = 4+4+3 = 11$

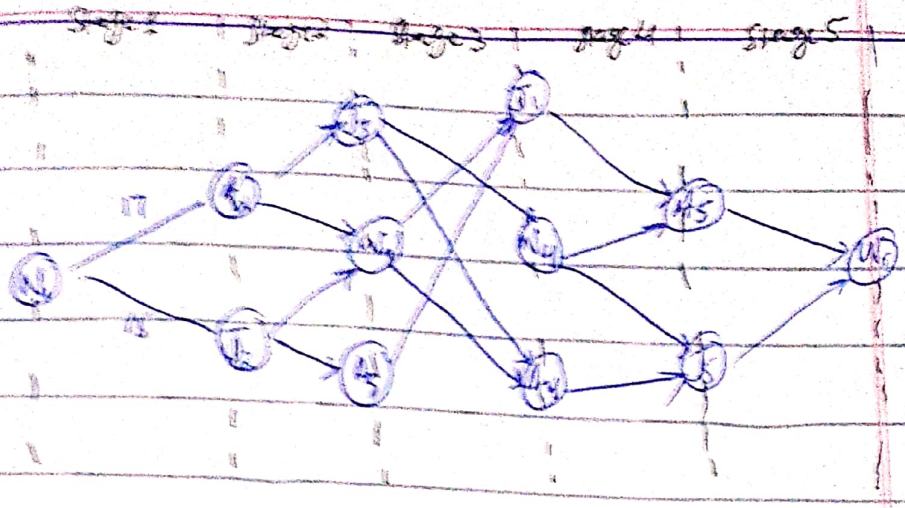
$W \rightarrow A = 6+6+5 = 17$

$A \rightarrow W = 5+5+5 = 15$

$J \rightarrow A = 4+4+2 = 10$

conditions :-

- Hike as many miles as possible ⇒ farthest path construction
- Climb one mountain each day ⇒ 5 stages for 5 days.
- Start at Mountain Washington and return at same spot at end of days.



working

Stage 5

$(W_2 : A_5) = 15$

$(W_3 : J_5) = 11$

Stage 4

$(J_4 = W_6) = 15 + 10 = 25$

$W_4 : W_6 = \max\{15+4 = 19,\ 17+15 = 32\} = 32$

$(W_4 : J_5) + (J_5 : W_6)$

$(W_4 : A_5) + (A_5 : W_6)$

$(A_4 : W_6) = 11 + 12 = 23$

Stage 3

$(J_3 : W_6) = \text{maximum}$

$\{(J_3 : W_4) + (W_4 : W_6) = 1 + 32 = 43\}$

$\{(J_3 : A_4) + (A_4 : W_6) = 10 + 23 = 33\}$ $= 43$

$(W_3 : W_6) = \max\{(W_3 : J_4) + (J_4 : W_6) = 15 + 25 = 40,\ (W_3 : A_4) + (A_4 : W_6) = 17 + 23 = 40\} =$

$(A_3 : W_6) = \max\{(A_3 : J_4) + (J_4 : W_6) = 12 + 25 = 37,\ (A_3 : W_4) + (W_4 : W_6) = 15 + 32 = 47\}$

Stage 2

$(A_2 : W_6) = \max \begin{cases} 12+43 = 55 \\ 15+40 = 55 \end{cases} = 55$

$(J_2 : W_6) = \max \begin{cases} 11+40 = 51 \\ 10+47 = 57 \end{cases} = 57$

Stage 1

$(W_1 : W_6) = \max \begin{cases} 17+55 = 72 \\ 15+57 = 72 \end{cases}$

There are multiple plans for visiting 72 miles.

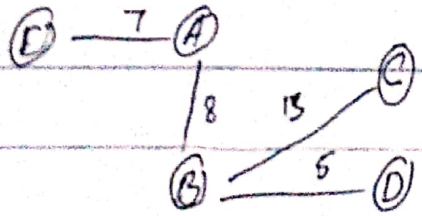
Path 2:

$W_1 \rightarrow A_2 \rightarrow W_5 \rightarrow A_4 \rightarrow J_3 \rightarrow W_6$

Path 3: $W_1 \rightarrow A_2 \rightarrow W_3 \rightarrow J_4 \rightarrow A_5 \rightarrow W_6$

QNO: - 2

Minimum Spanning Tree



Minimum Shortest distance = 7+8+13+5

= 33

Question #4

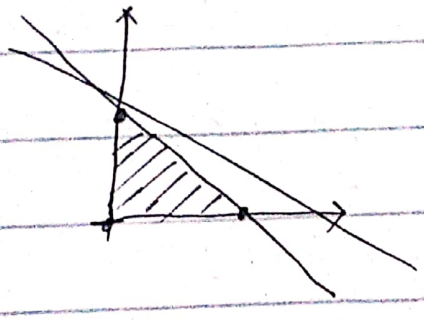
Max $z = 2x_1 + 2x_2$

Subject to

$2x_1 + 5x_2 \leq 27$

$6x_1 + 5x_2 \leq 16$

$x_1, x_2 \geq 0$



① $x_1 = 0$, $x_2 = 0$, Max $z = 0$

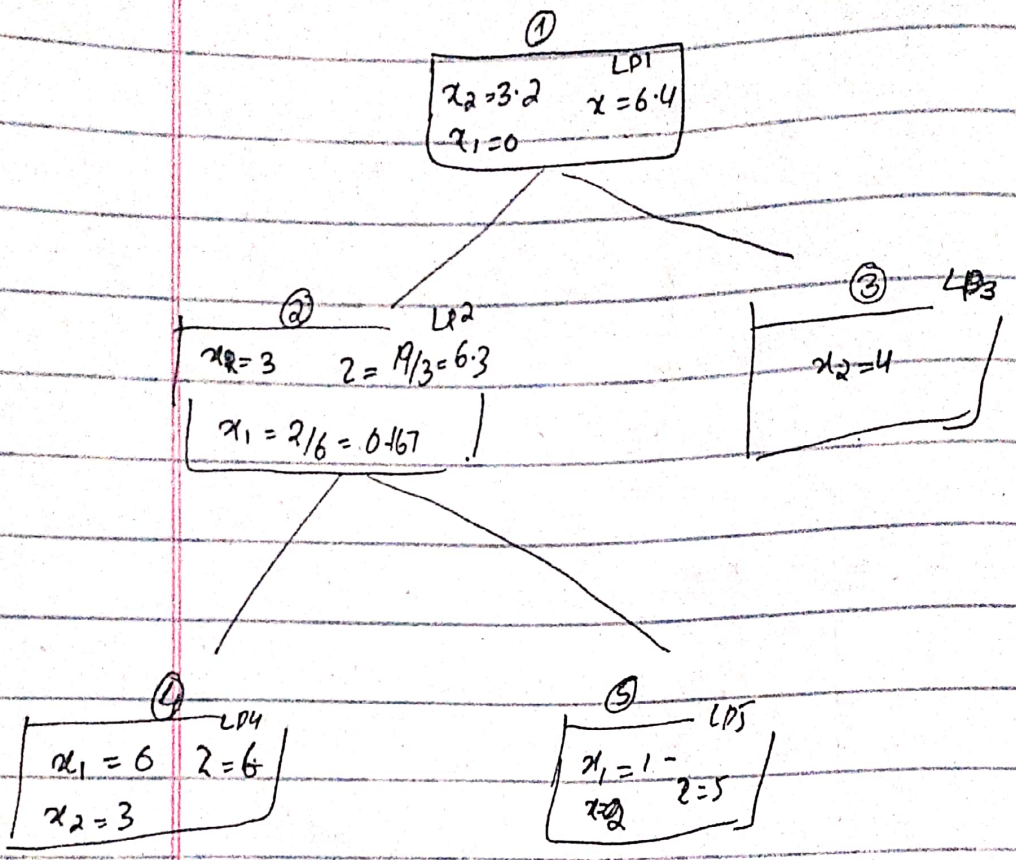
② $x_1 = 0$ $x_2 = 3.2$, Max $z = 2(0) + 2(3.2) = 6.4$

③ $x_1 = 2.667$, $x_2 = 0$, Max $z = 2(2.667) + 2(0) = 5.334$

Selecting the second point for branching as it gives us the maximum result.

Branching w.r.t x_2:

Branching on Next Page



LP2

$x_2 = 3$

$6x_1 + 5(3) = 16$

$6x_1 = 1$

$x_1 = 1/6$

$z = 2(1/6) + 2(3)$

$z = 19/3$

LP4

$x_1 = 0$ $\quad z = 2(0) + 2(3)$

$x_2 = 3$ $\quad = 6$

LP5

$x_1 = 1$

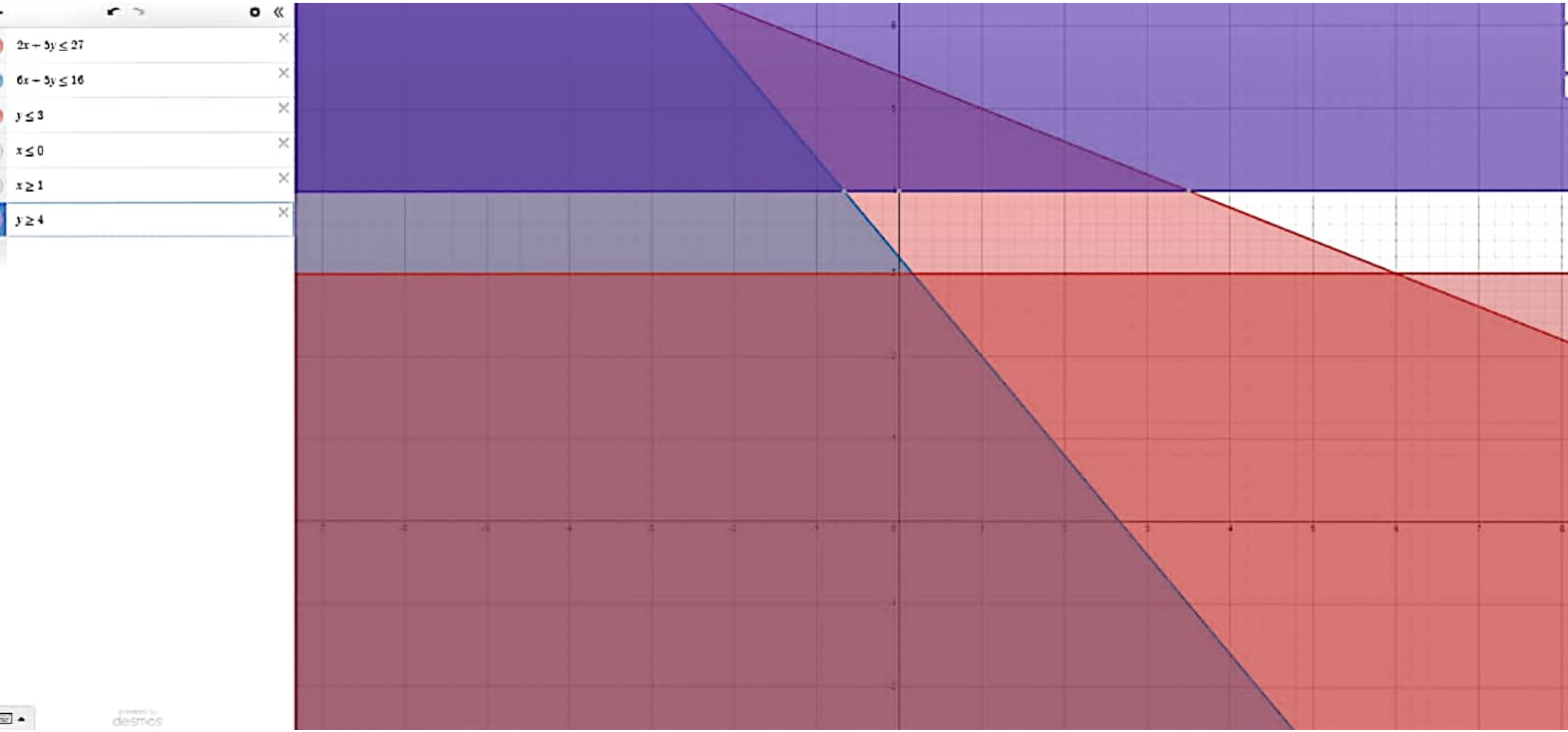
$6x_1 + 5x_2 = 16$

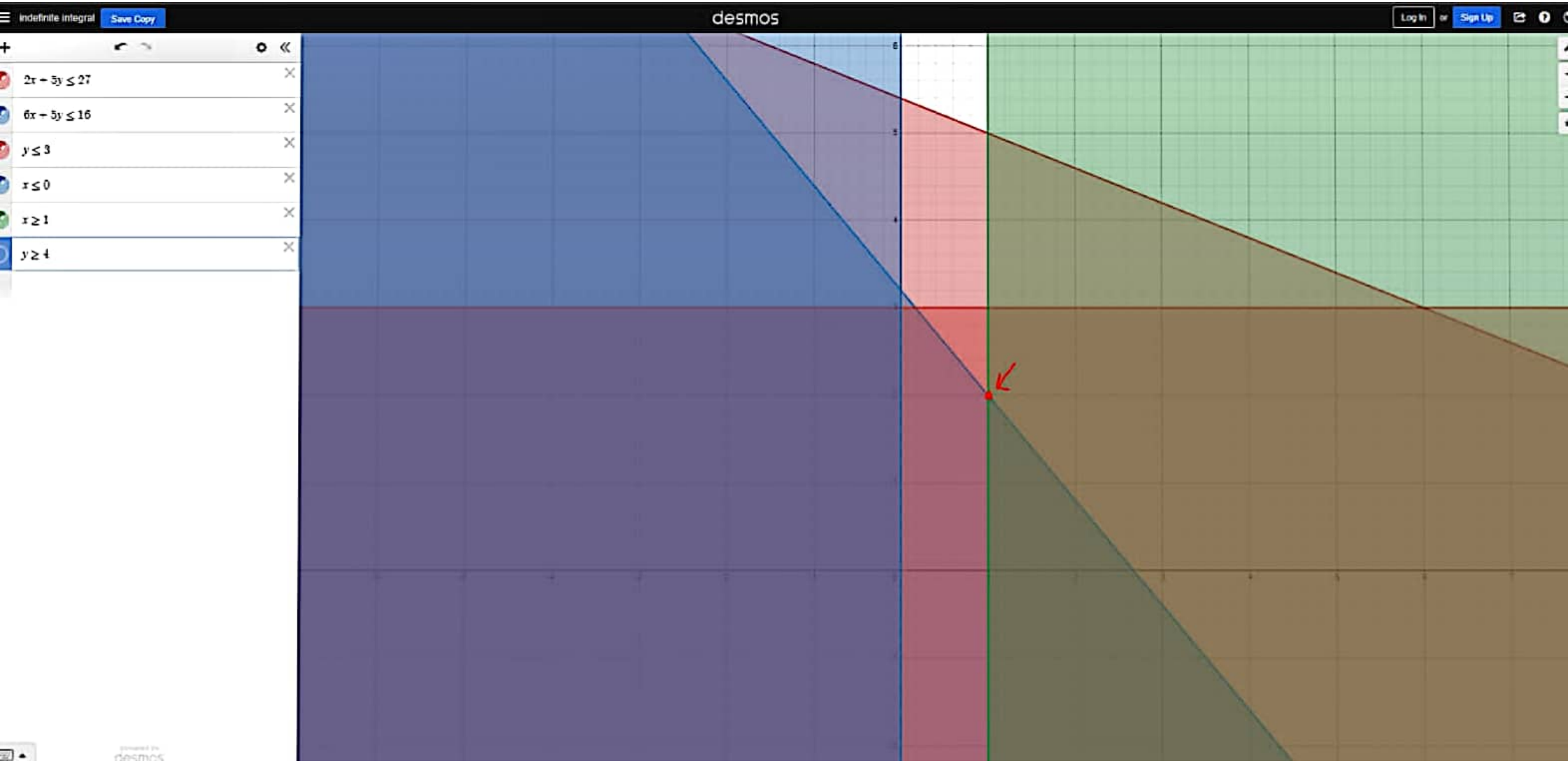
$6(1) + 5x_2 = 16$

$5x_2 = 10$

$x_2 = 2$

$z = 2(1) + 2(2) = 6$

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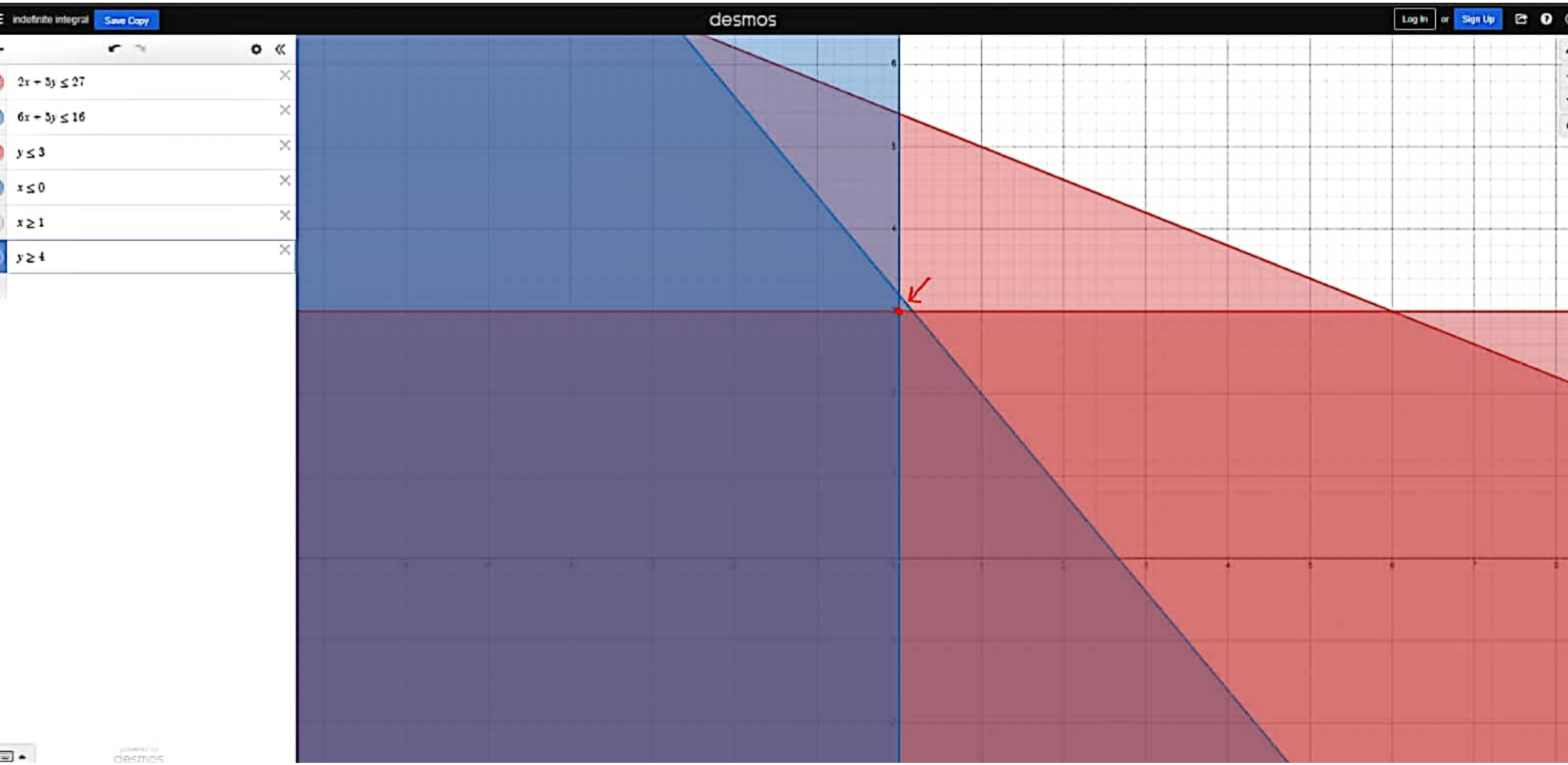
2x − 5y ≤ 27
6x − 5y ≤ 16
y ≤ 3
x ≤ 0
x ≥ 1
y ≥ 4


indefinite integral
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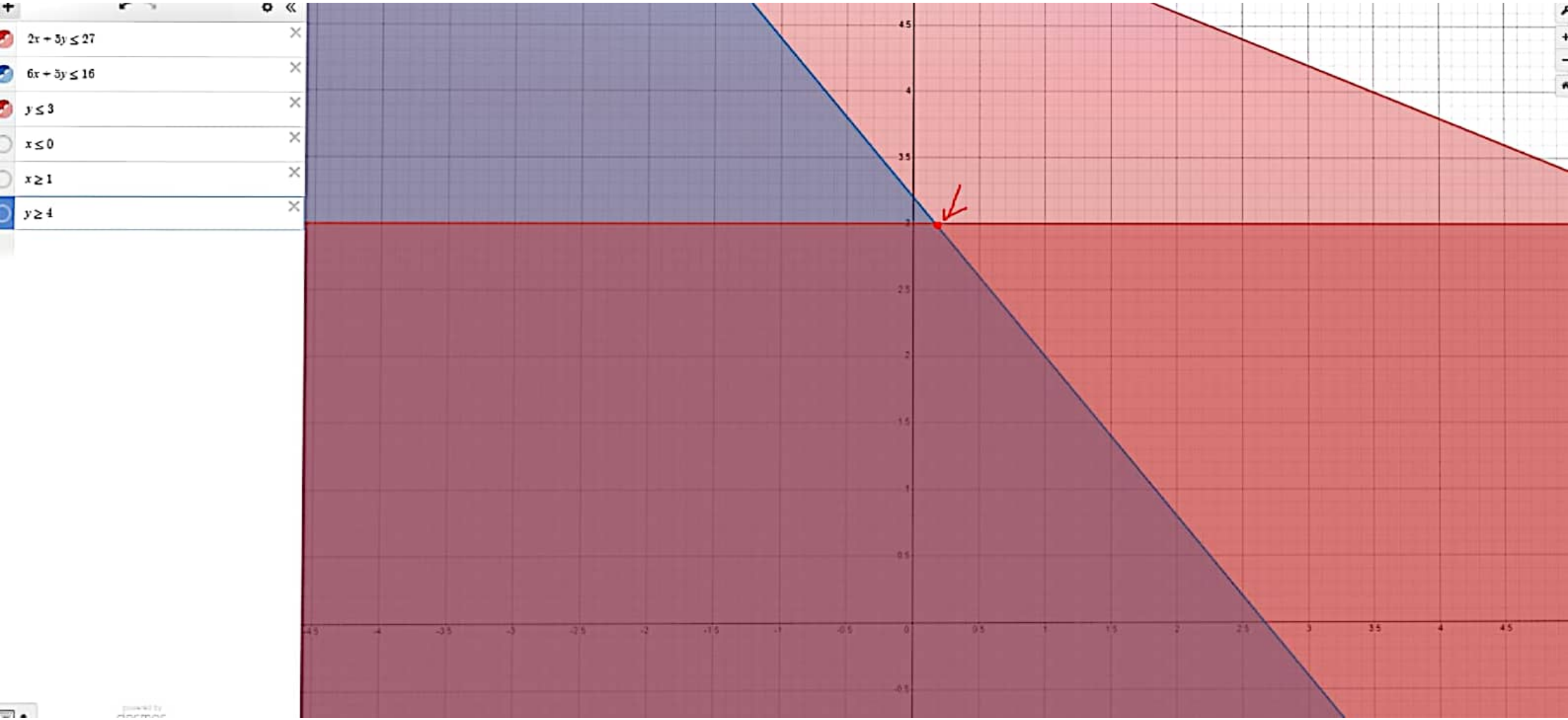
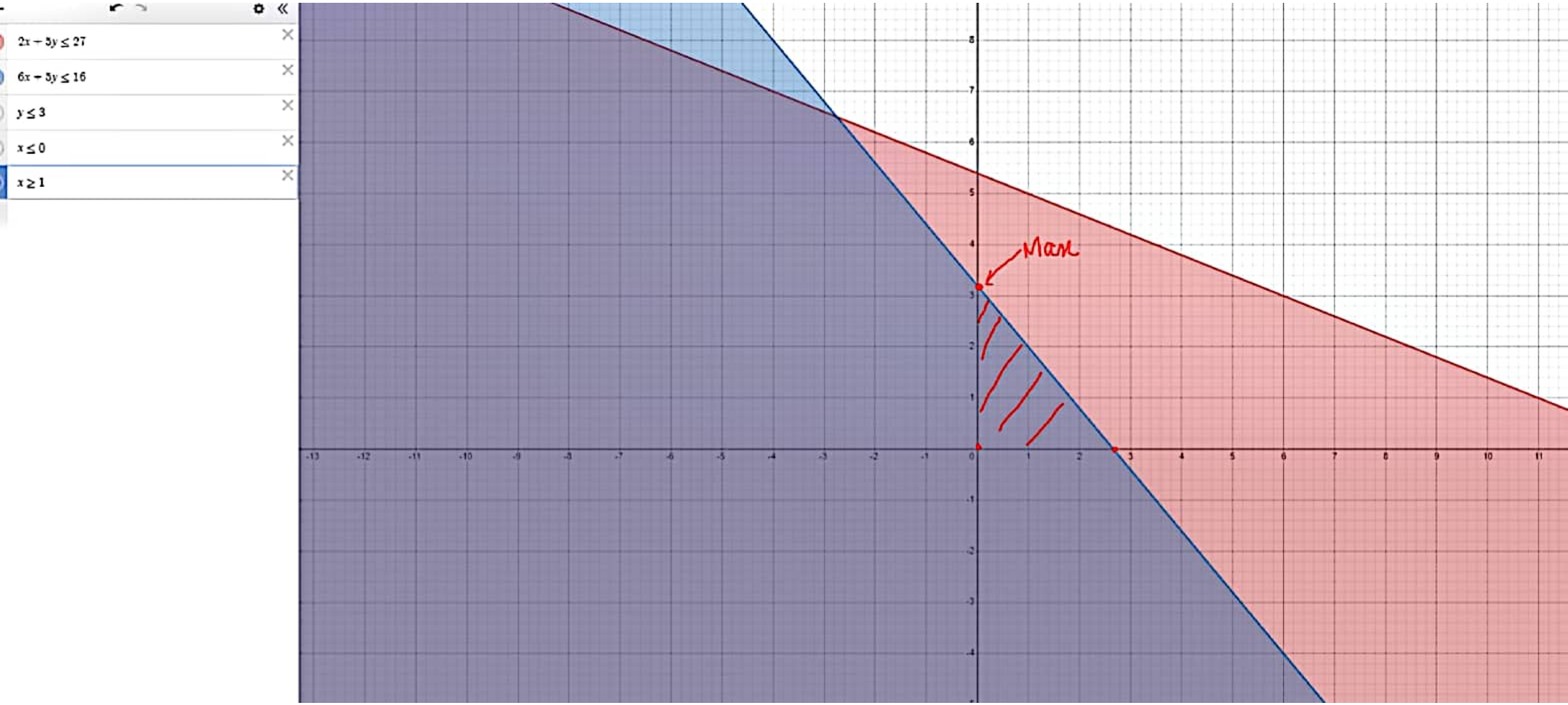
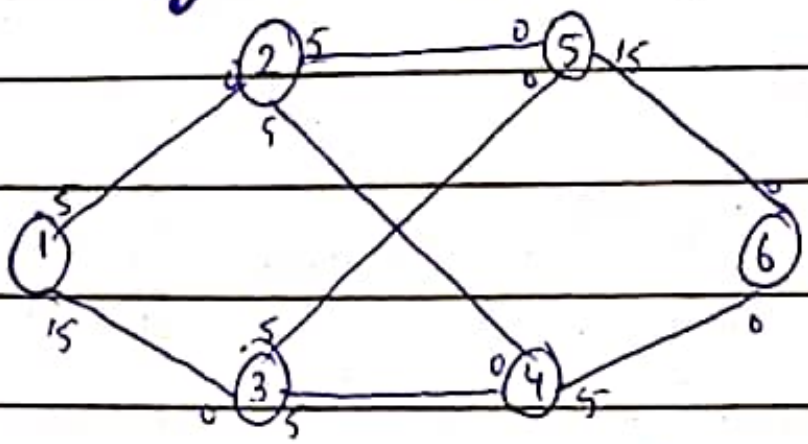
$2x + 3y \le 27$
$6x + 3y \le 16$
$y \le 3$
$x \le 0$
$x \ge 1$
$y \ge 4$







⇒ Iteration # 01

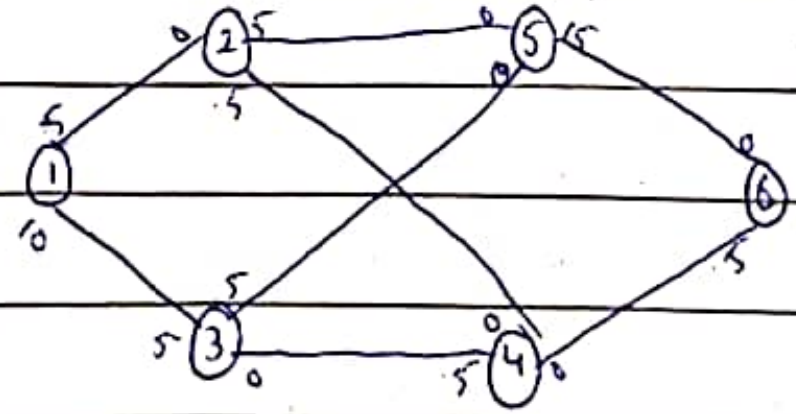
$q_1 = [\infty, -]$

$q_6 [5,4]$

$q_3 = [15,1]$ $q_4 = [5,3]$

$\eta_1 = \min \{ q_1, q_2, q_3, q_4, q_5, q_6 \}$

$= \min \{ \infty, \phi, 15, 5, \phi, 5 \} = 5 \Rightarrow \boxed{\eta_1 = 5}$



⇒ Iteration # 02

$[\infty, -]$

$q_6 = [15,5]$

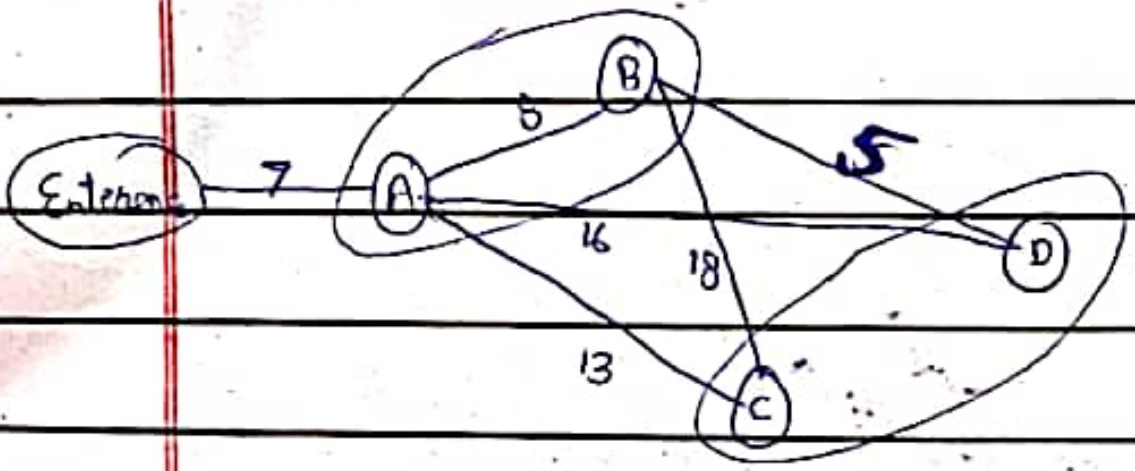
$q_3 = [10,1]$

$\eta_2 = \min \{ q_1, q_3, q_5, q_6 \}$

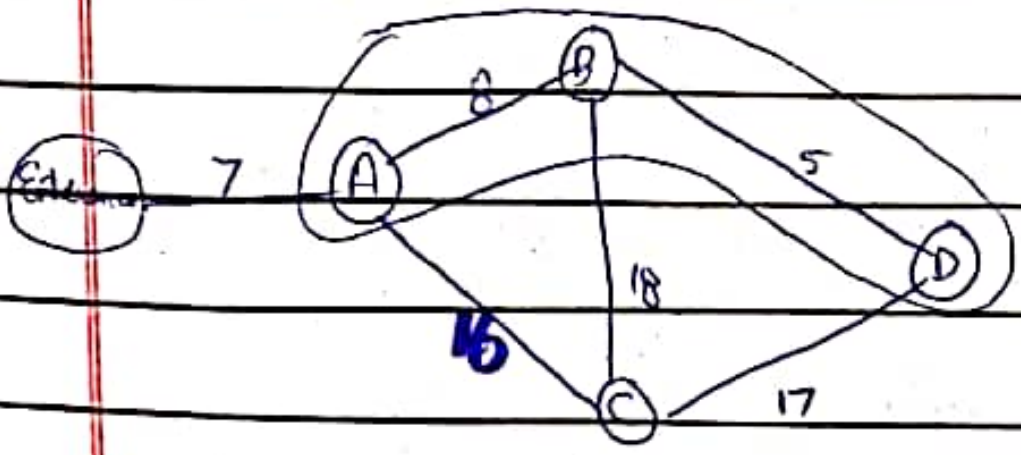
$= \min \{ \infty, 10, 5, 15 \} = 5$

$\Rightarrow \boxed{\eta_2 = 5}$

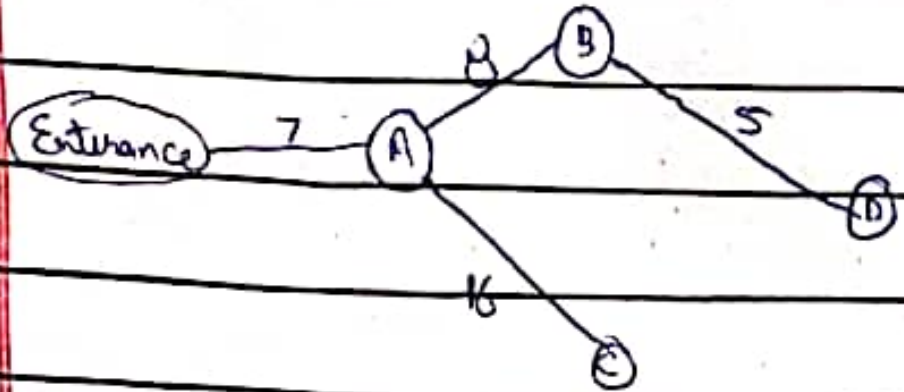
Iteration # 02:



Iteration # 03



Final:



In this manner the roads should be build.