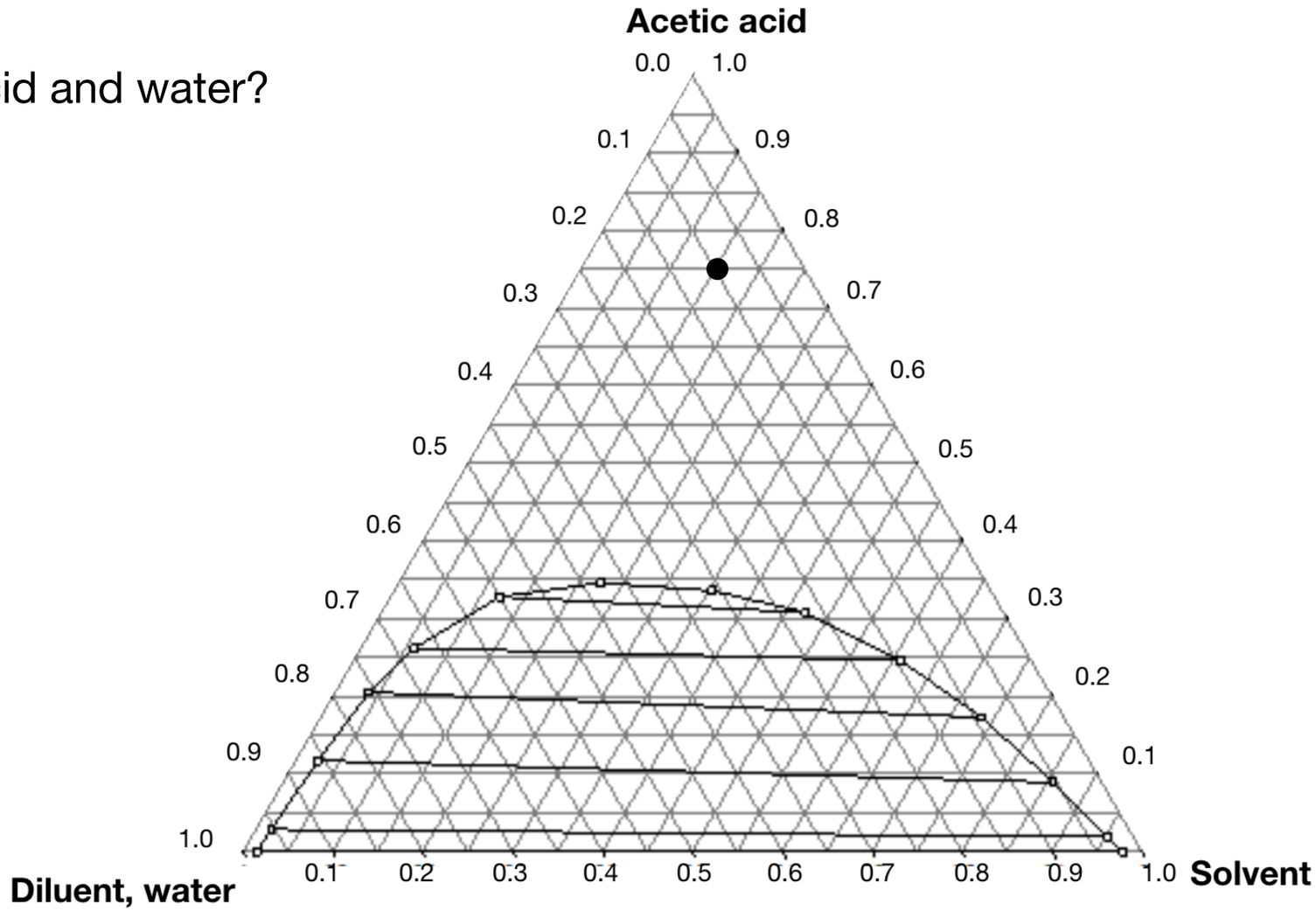
Review Quiz

What is the composition of acetic acid and water?

A. 0.25 and 0.9
B. 0.75 and 0.1
C. 0.25 and 0.85
D. 0.25 and 0.25



Review Quiz

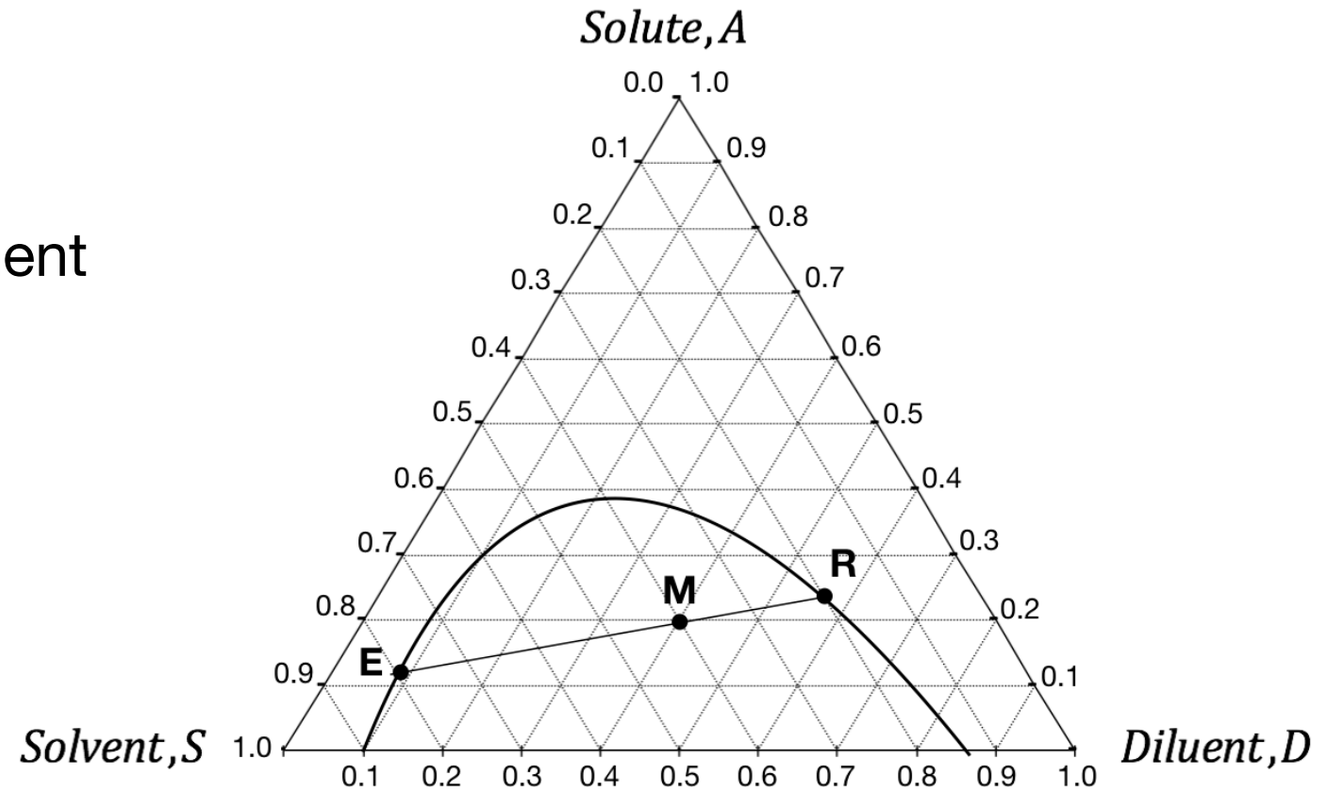
Which statement is correct

A. E > R

B. R > E

C. R = E

D. Not enough information to comment



Review Quiz

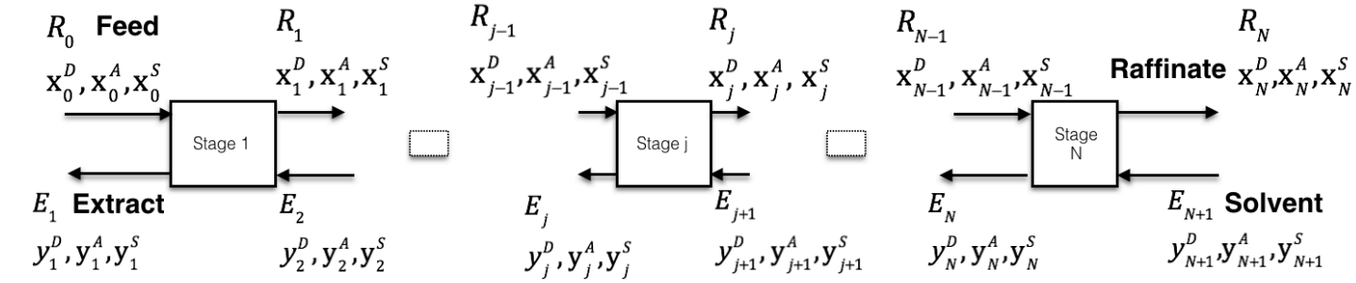
In cross-current operation, we noted that E_1 and R_N will be on equilibrium line. Does this mean that the line connecting E_1 and R_N is a tie line?

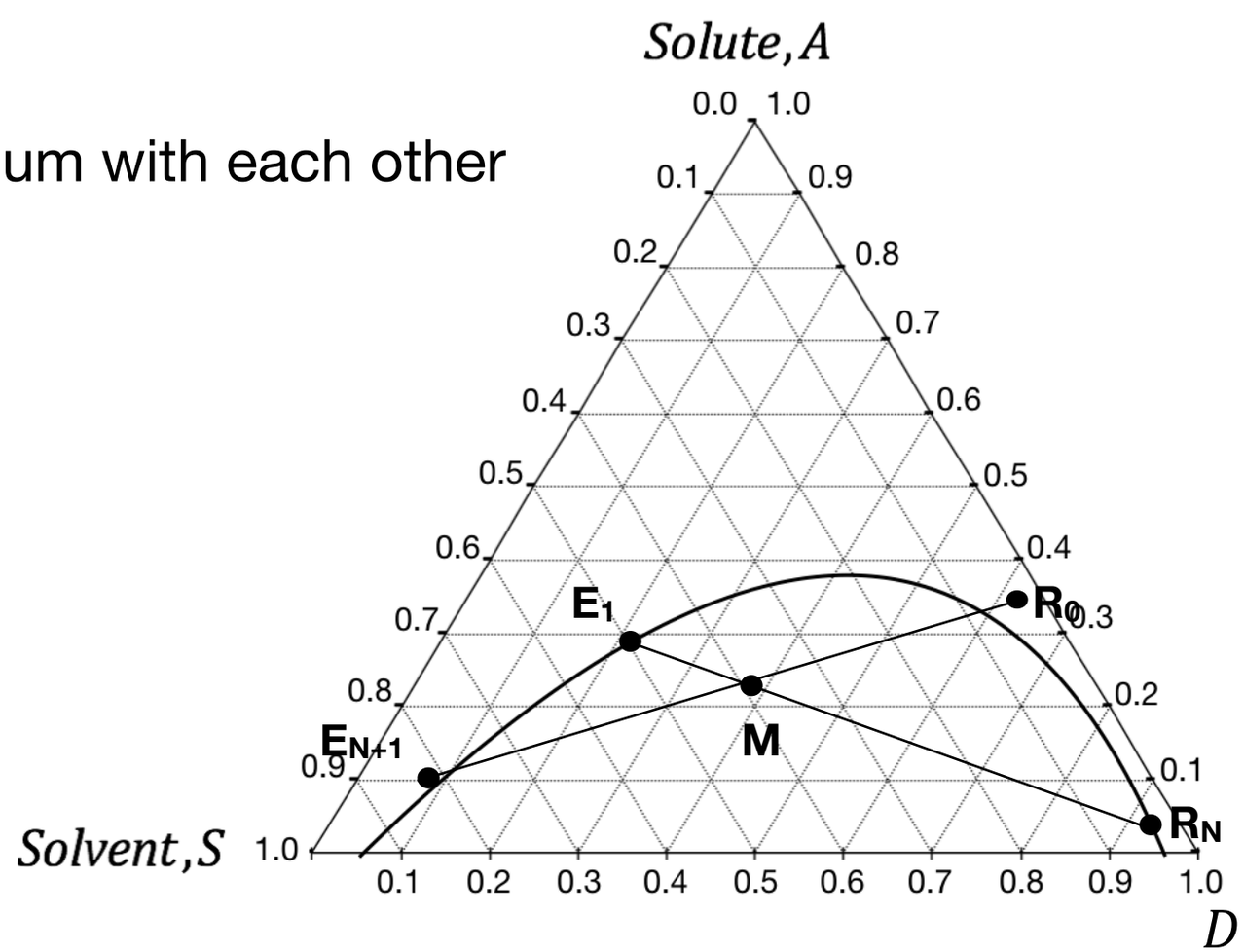
A. Yes, E_1 and R_N are in equilibrium

B. No

C. Yes, because E_1 and R_N are in equilibrium with each other

D. Not enough information to comment





Review Quiz

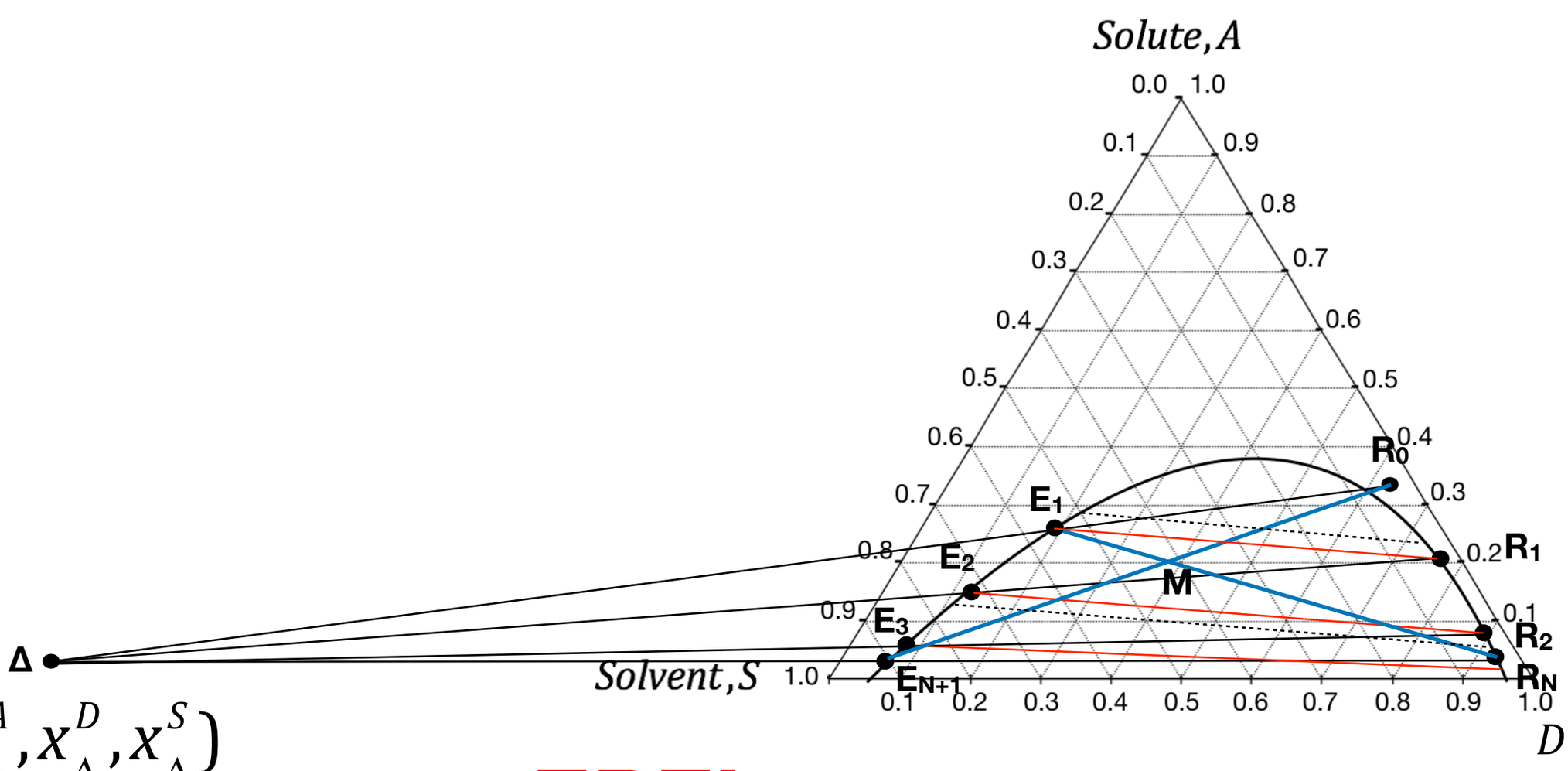
In cross-current operation shown below, which ones are the operating line?

A. E_1R_N

B. R_oE_{N+1}

C. $R_1\Delta$

D. MR_o



Review Quiz

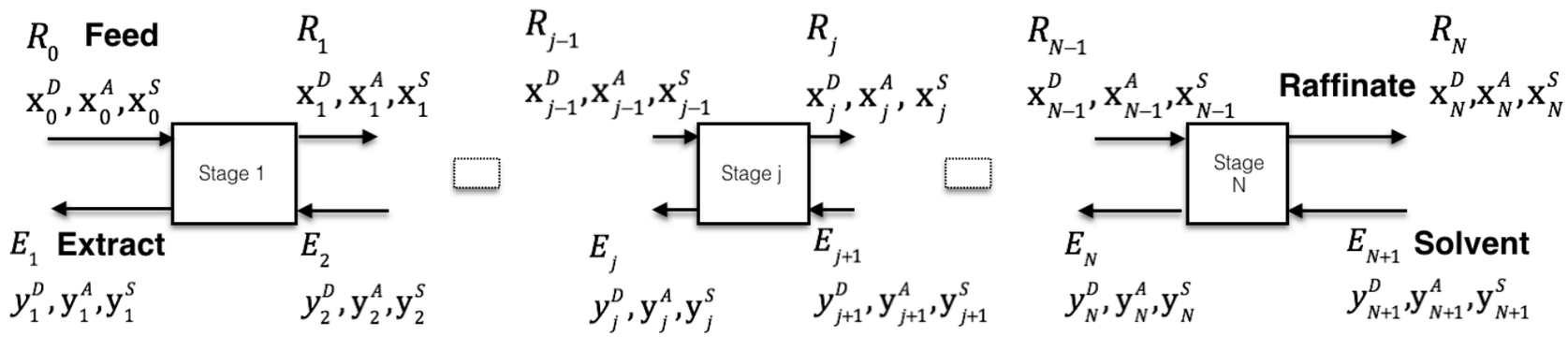
Which of the following lines represent tie line.

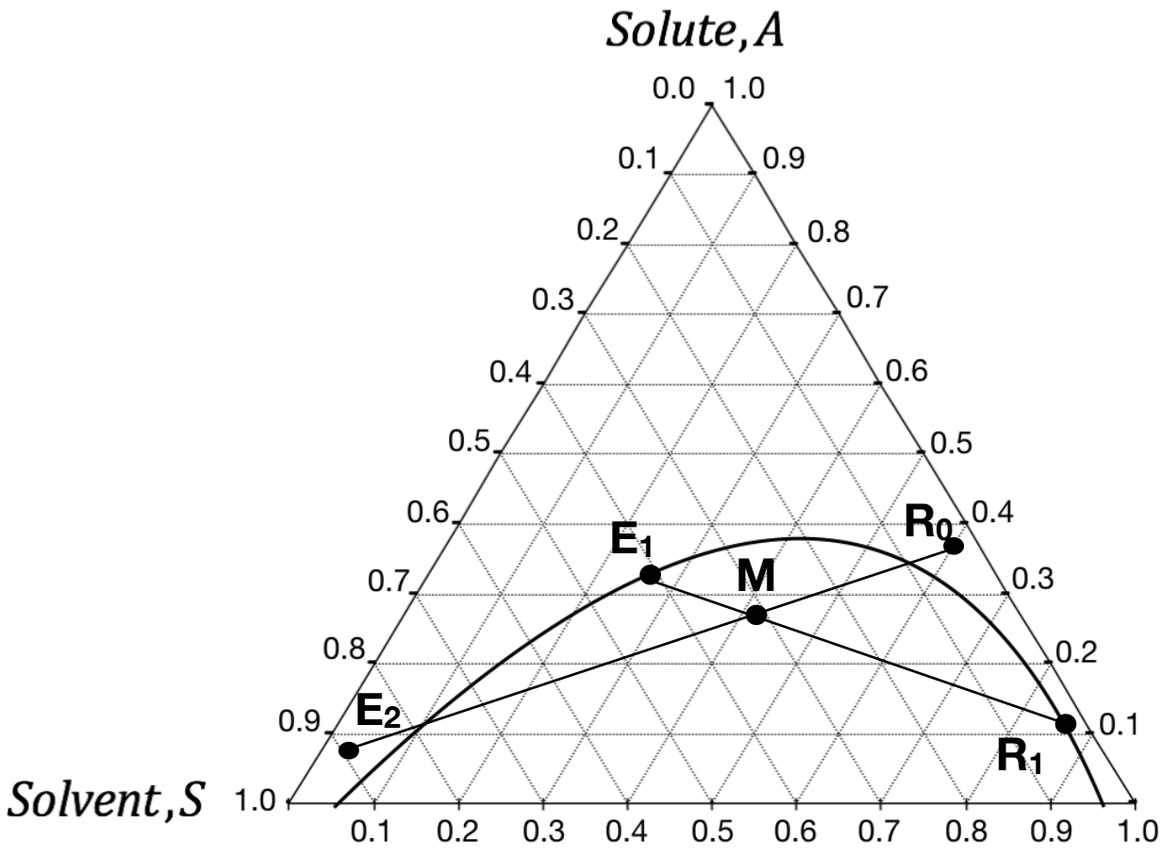
A. E_2 R_0 (left figure)

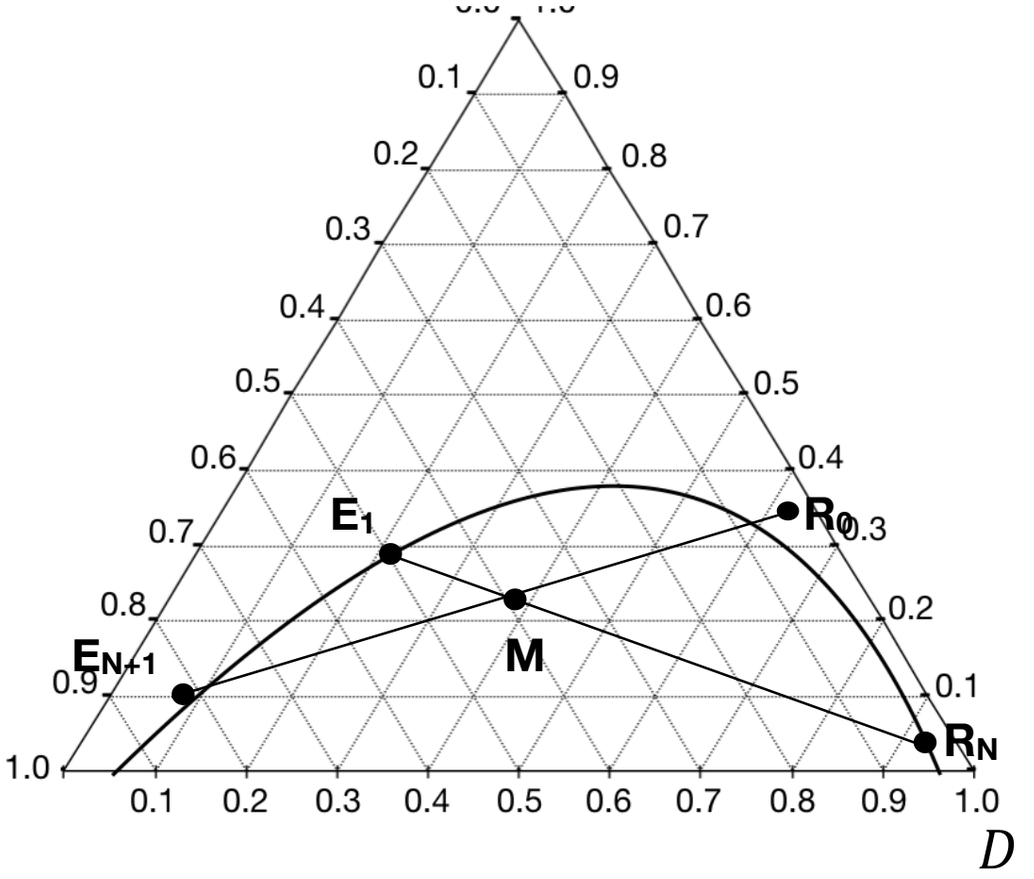
B. E_1 R_1 (left figure)

C. E_1 R_N (right figure)

D. None





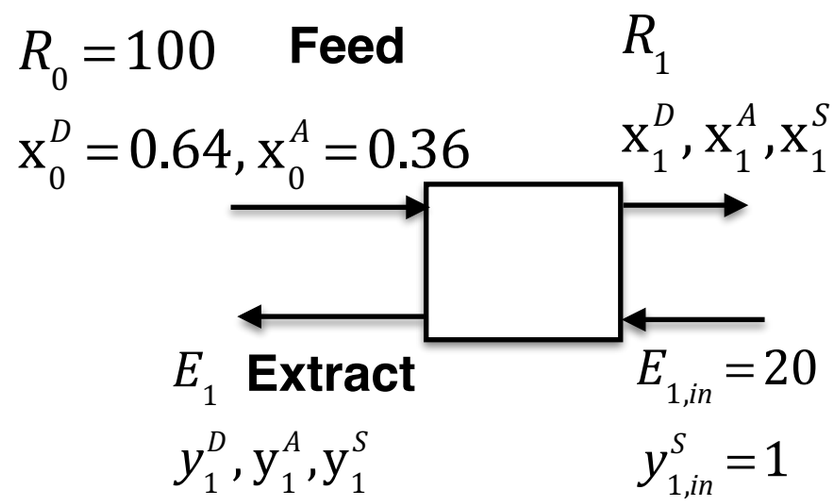


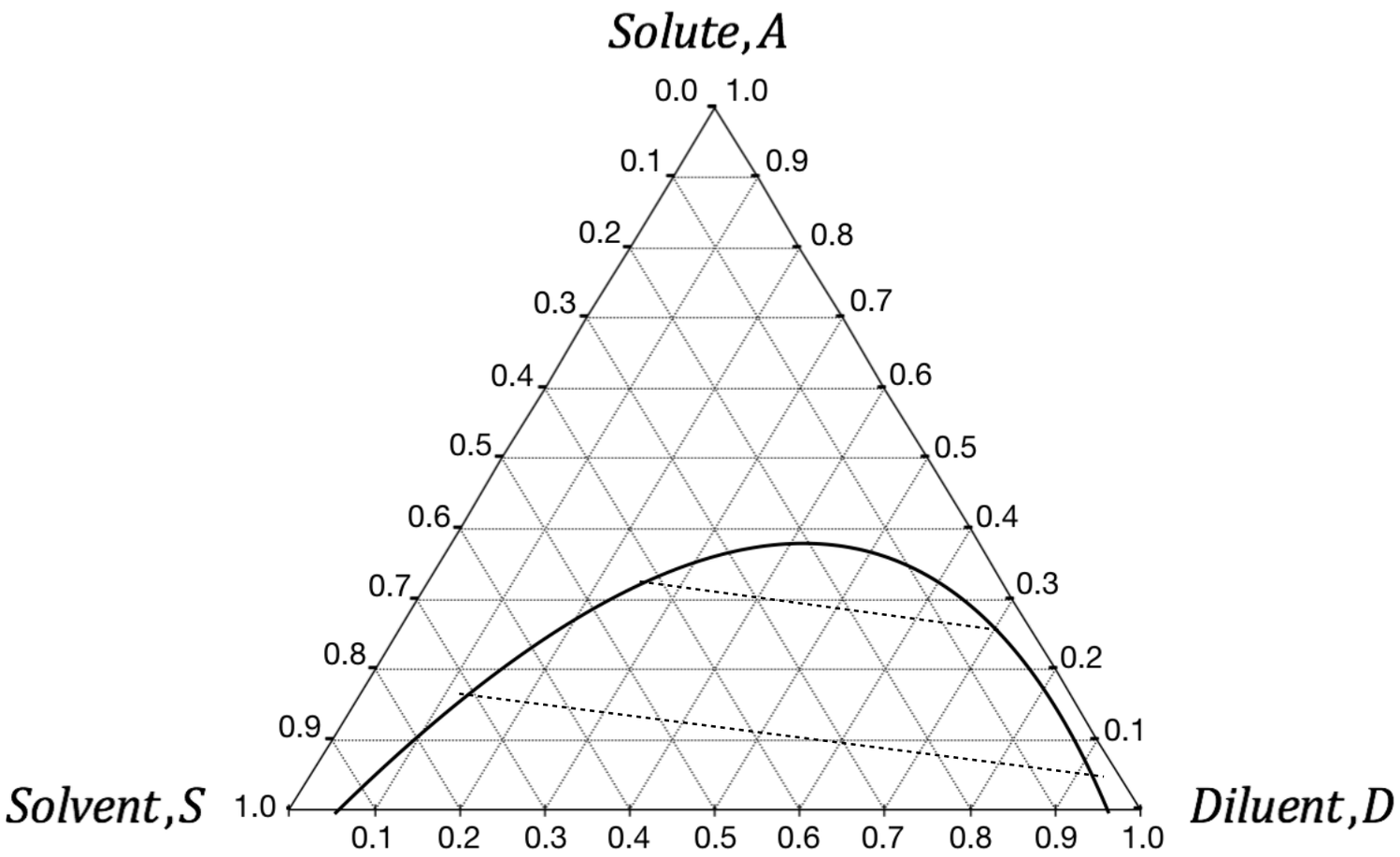
In-class exercise problem: Single-stage countercurrent LLE

Calculate

E_1

y_1^D, y_1^A, y_1^S





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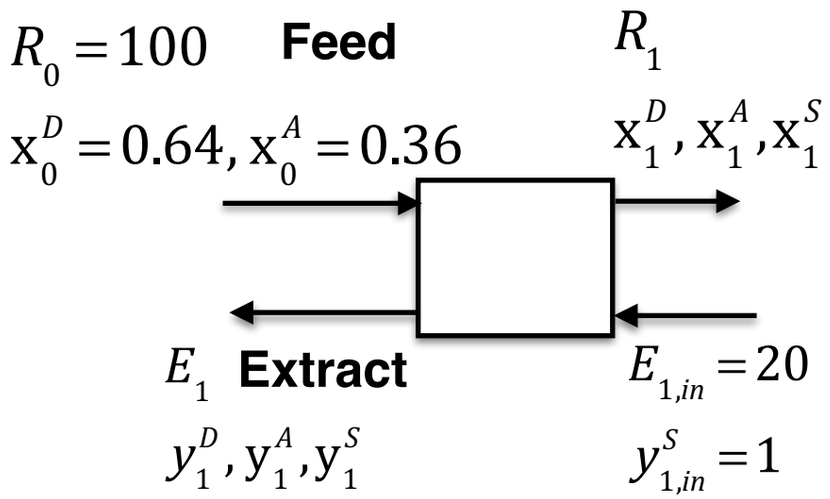


$$z_{M1}^A = \frac{E_{1,in} y_{1,in}^A + R_0 x_0^A}{E_{1,in} + R_0} = 0.30$$

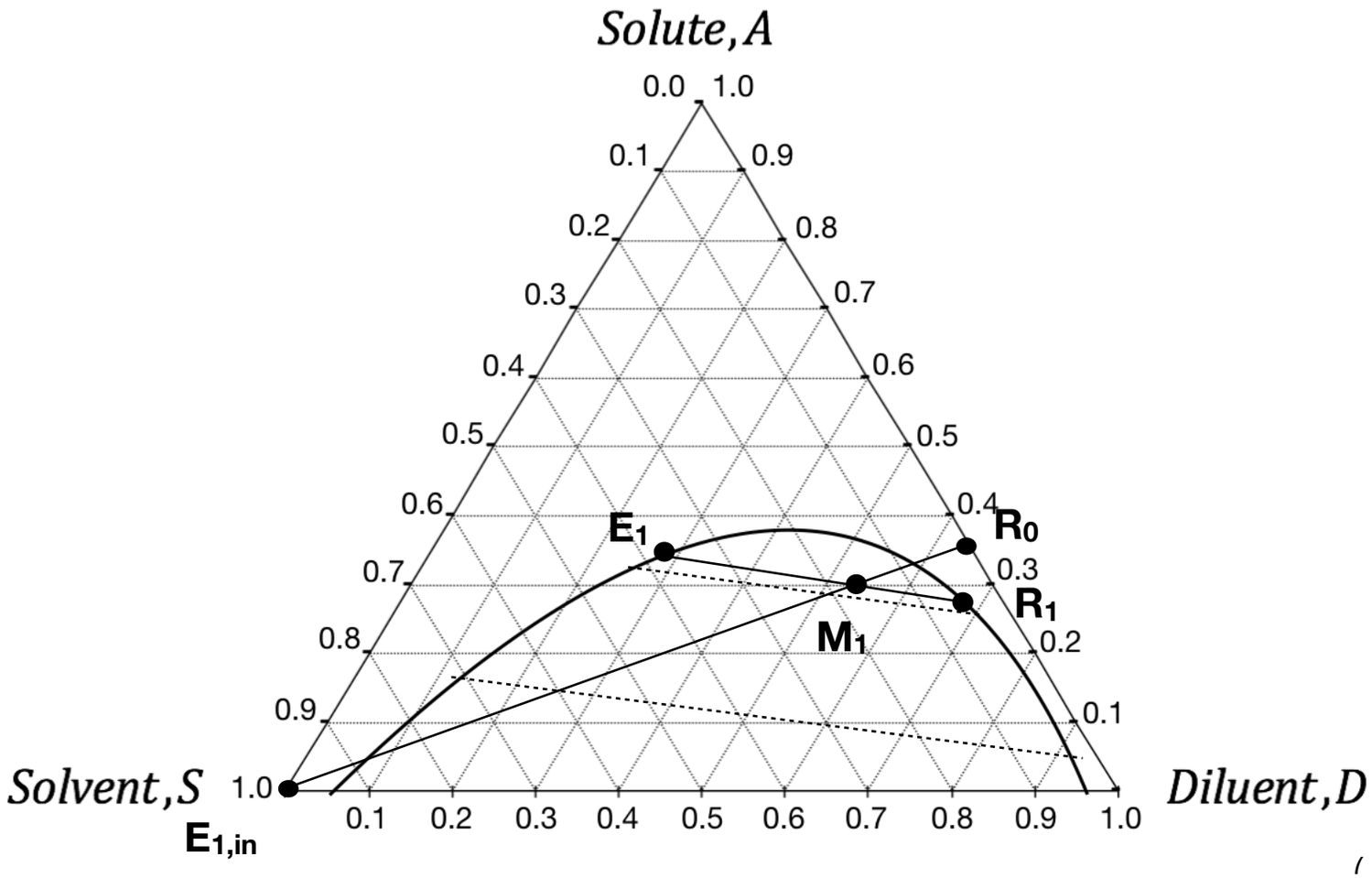
$$z_{M1}^D = \frac{E_{1,in} y_{1,in}^D + R_0 x_0^D}{E_{1,in} + R_0} = 0.53$$

$y_1^A = 0.35 \qquad y_1^D = 0.28$

$x_1^A = 0.28 \qquad x_1^D = 0.68$

$R_1 = 33/52 * (100 + 20) = 76.15$

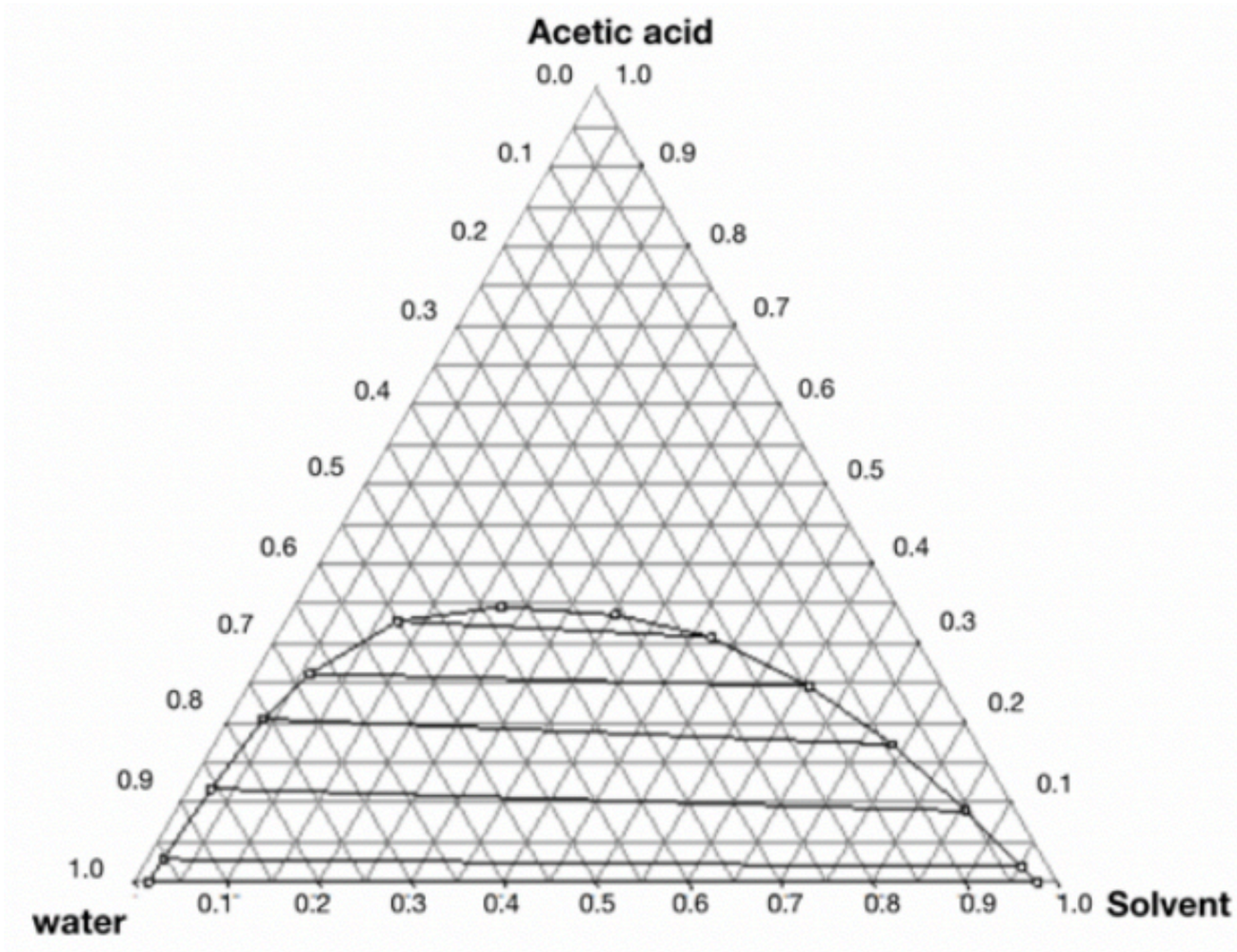
Measured using ruler (lever rule)



In-class exercise problem

A solution of acetic acid in water is fed at 100 kg/hr to an extraction unit where a solvent is introduced in a countercurrent mode. The solvent and diluent are partially miscible. The feed has 50% solute and no solvent. The solvent is fed at 100 kg/h and has 5% acetic acid and no water. We want to design extraction to reduce the concentration of acetic acid in the raffinate stream to 15%.

a) Calculate the composition of streams E_1 and R_1.
b) Calculate the needed number of stages and indicate all Ej and Rj.
c) For part b, indicate operating and equilibrium line.



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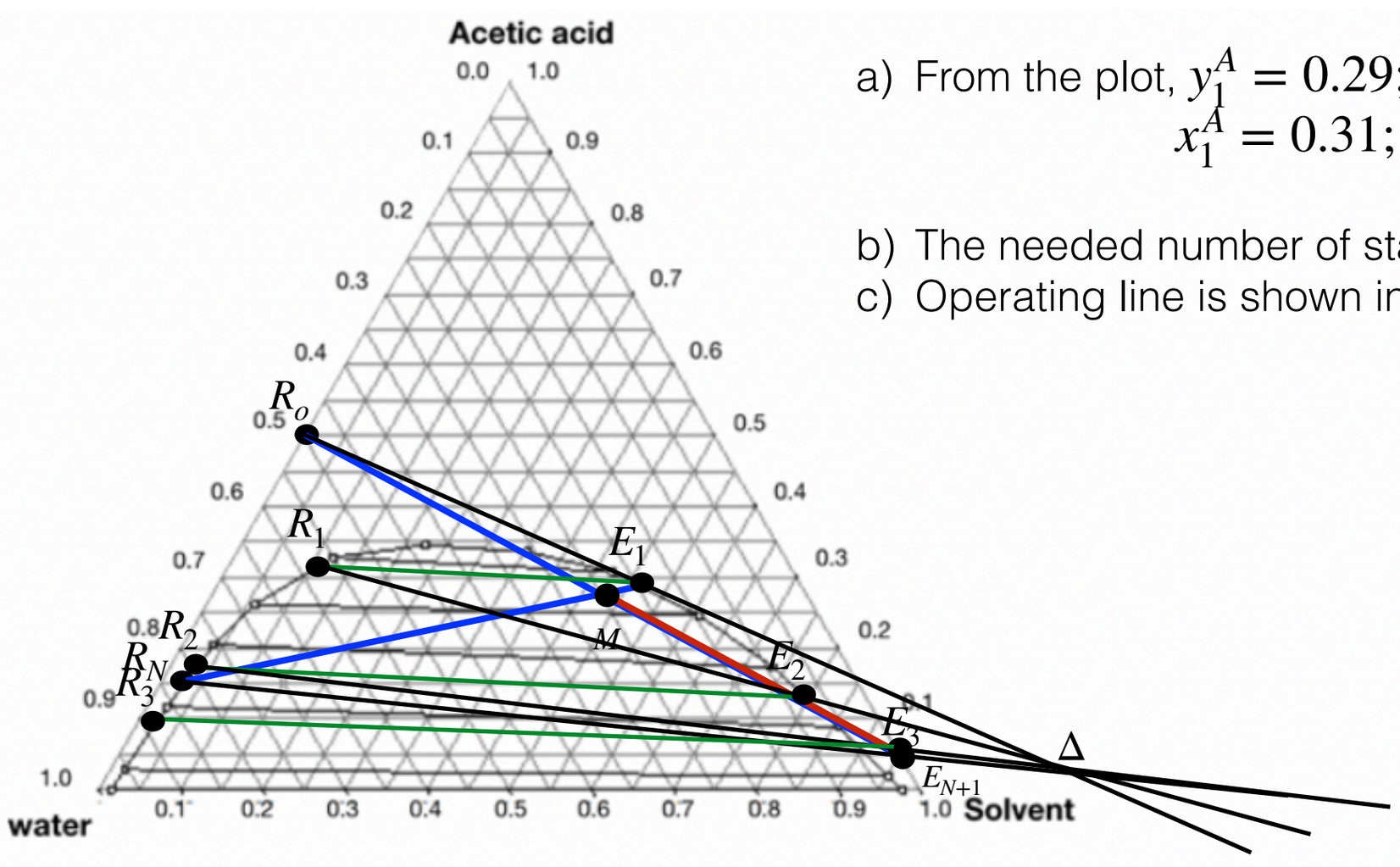

a) From the plot, $y_1^A = 0.29;\ y_1^D = 0.19;$
$x_1^A = 0.31; x_1^D = 0.57$

b) The needed number of stages = 3
c) Operating line is shown in black and equilibrium line in green