Review quiz

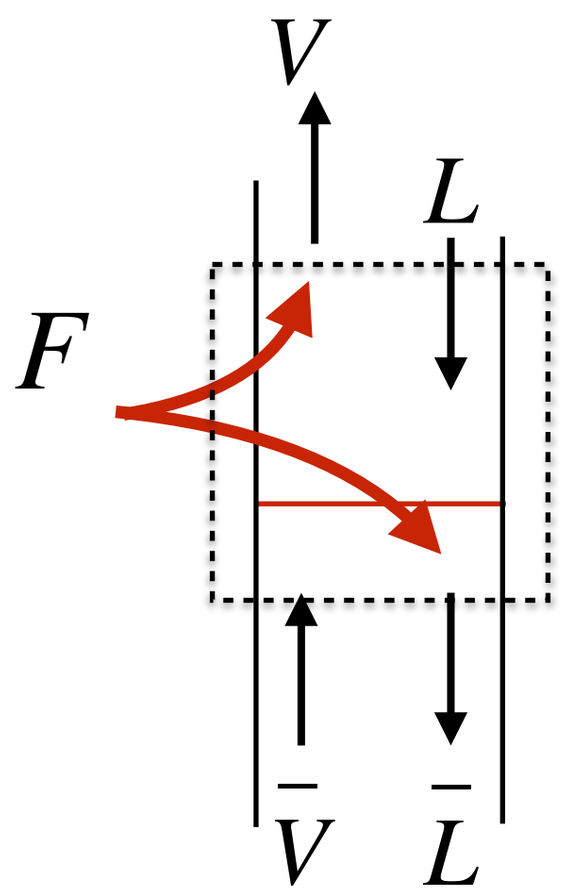
You are adding a saturated liquid feed F = 100. Calculate $\bar{L} - L$.

$A.\quad 50$

$B.\quad 0$

$C.\quad 100$

$D.\quad -100$



Simple observations

$V \geq \bar{V}$

$\bar{L} \geq L$

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Review quiz

You are adding a saturated vapor feed F = 100. Calculate $\bar{V} - V$.

$A.\quad 50$

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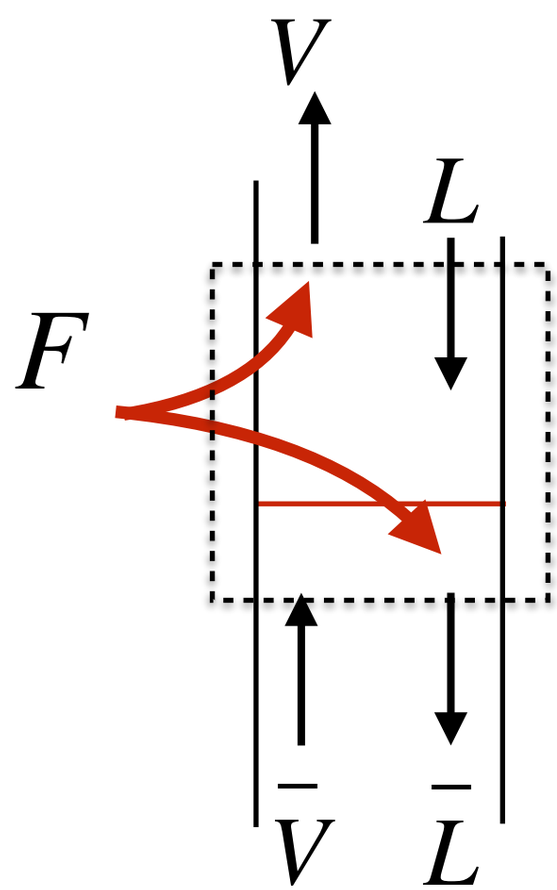

Simple observations

$V \geq \bar{V}$

$\bar{L} \geq L$

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Review quiz

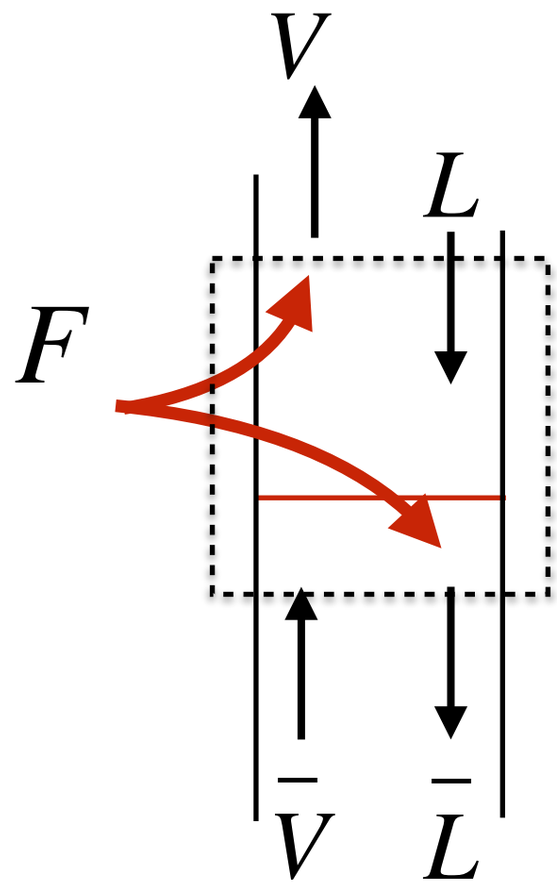
You are adding a subcooled liquid feed. Which of the following is NOT true.

$A.\quad q > 1$

$B.\quad \bar{L} - L > 0$

$C.\quad \bar{V} - V > 0$

$D.\quad \bar{L} - L = F$



Simple observations

$V \geq \bar{V}$

$\bar{L} \geq L$

Review quiz

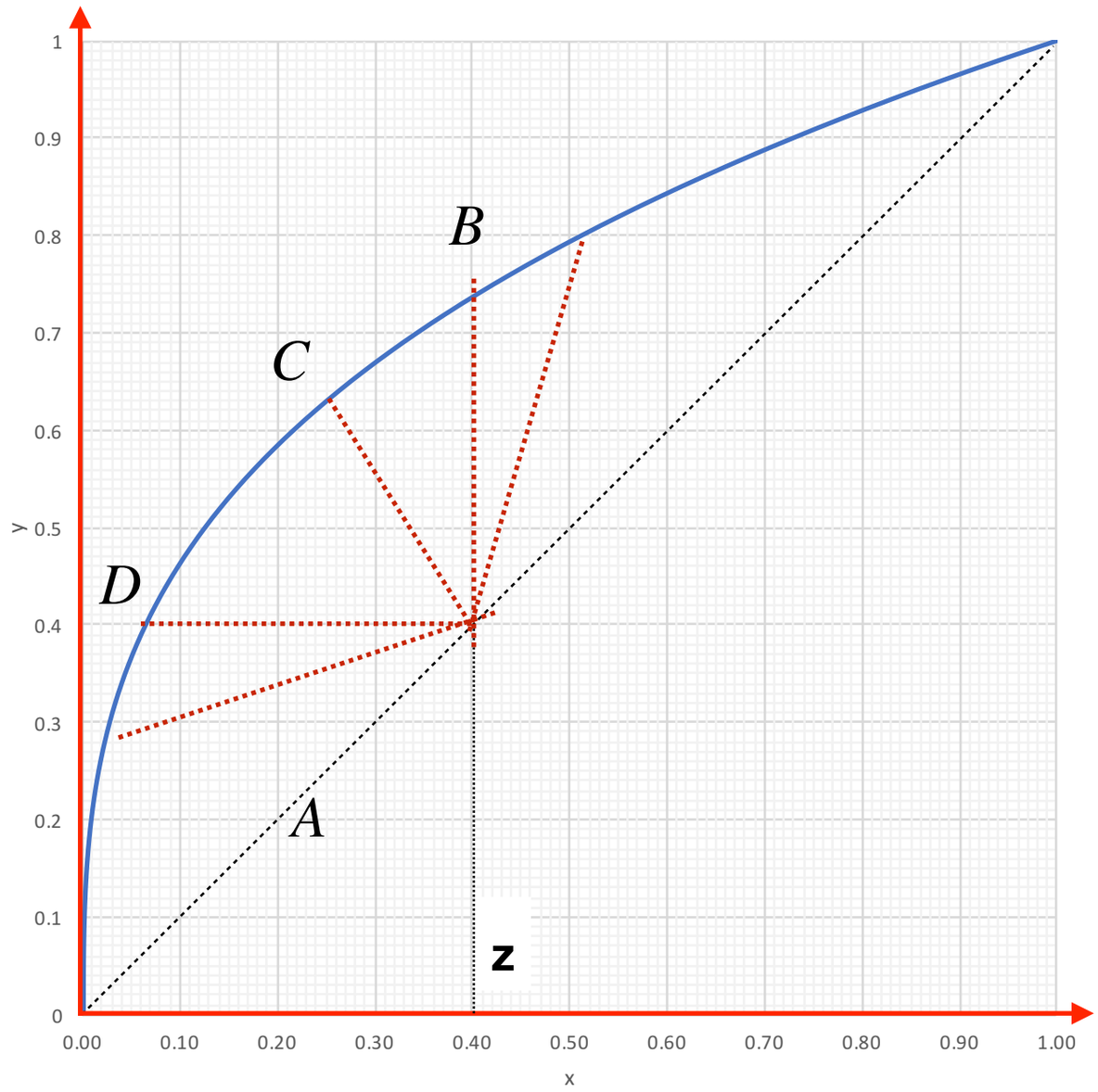
Which one of the following is saturated liquid feed line

A .

B .

C .

D .



Review quiz

What happens when you decrease the reflux ratio R to minimum, R_{min}

A. Number of stages $\rightarrow \infty$

B. $B \rightarrow \infty$

C. $F \rightarrow 0$

D. $D \rightarrow \infty$

Review quiz

What happens when you increase the reflux ratio R to maximum, ∞

A. Number of stages are maximized

B. L is minimized

C. The slope of both operating lines becomes 1

D. None of the above

Review quiz

You decided to replace a total condenser by a partial condenser. What will happen to the total number of equilibrium stages

A. They will stay the same

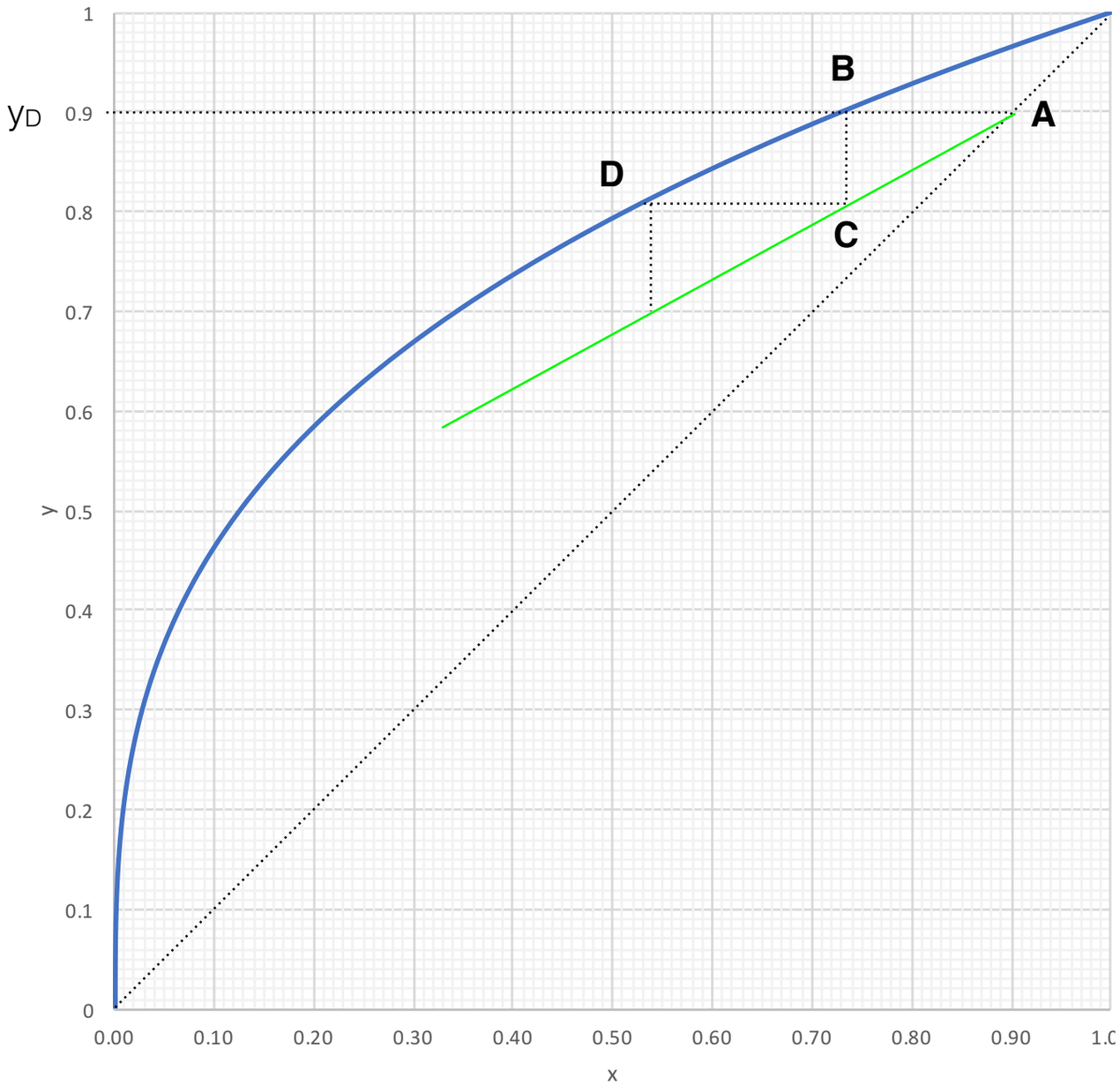
B. They will increase by 1

C. Total number of equilibrium stages will have to be determined by new operating lines

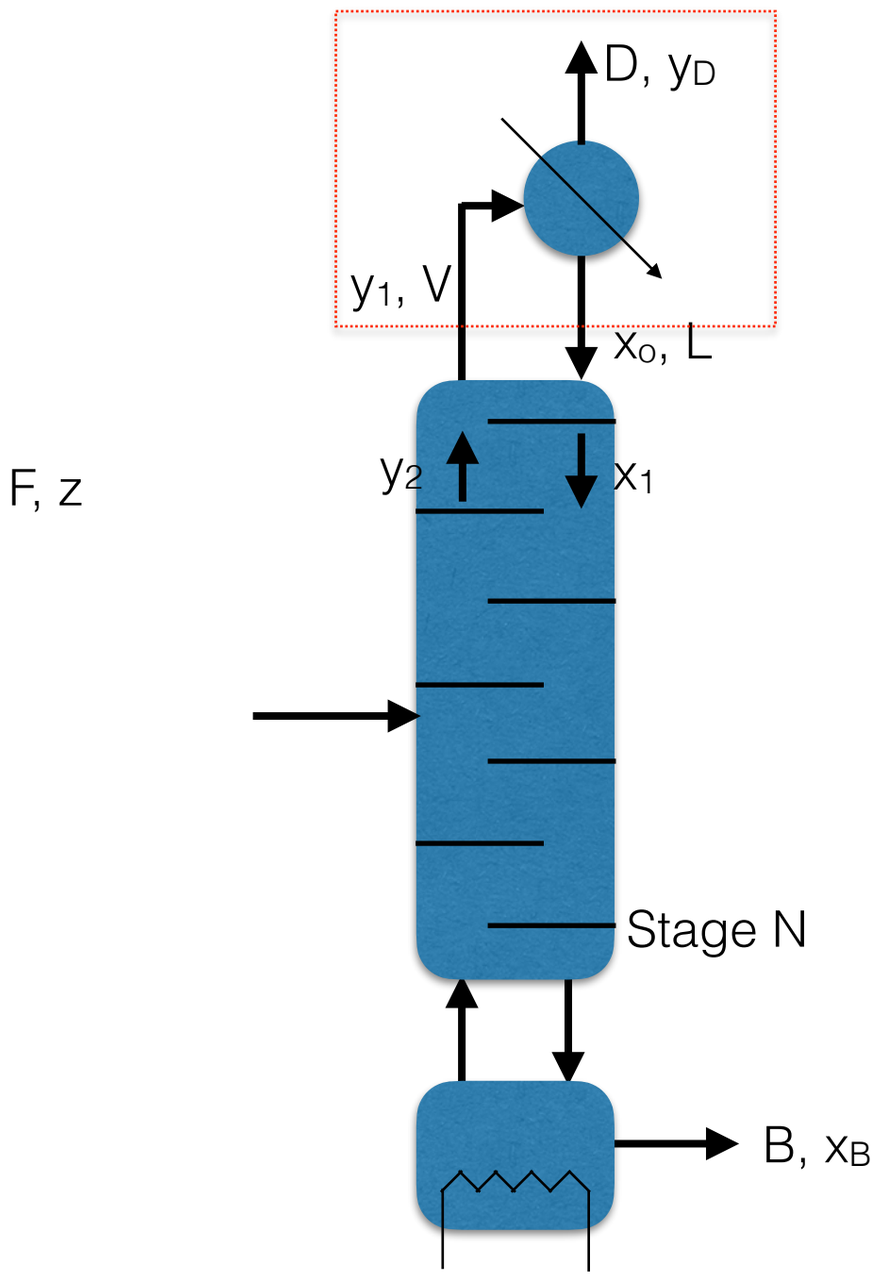
D. None of the above

Review quiz

Which points on the plot represent (x_1, y_1)



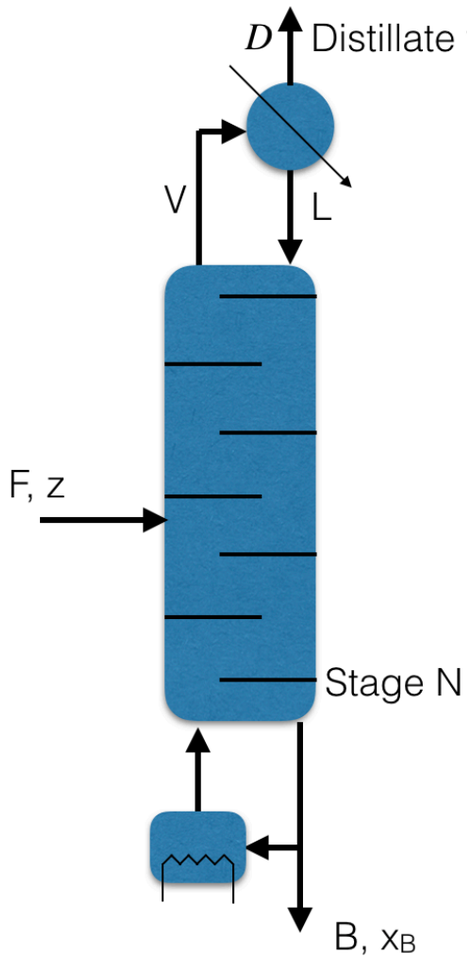
Partial condenser

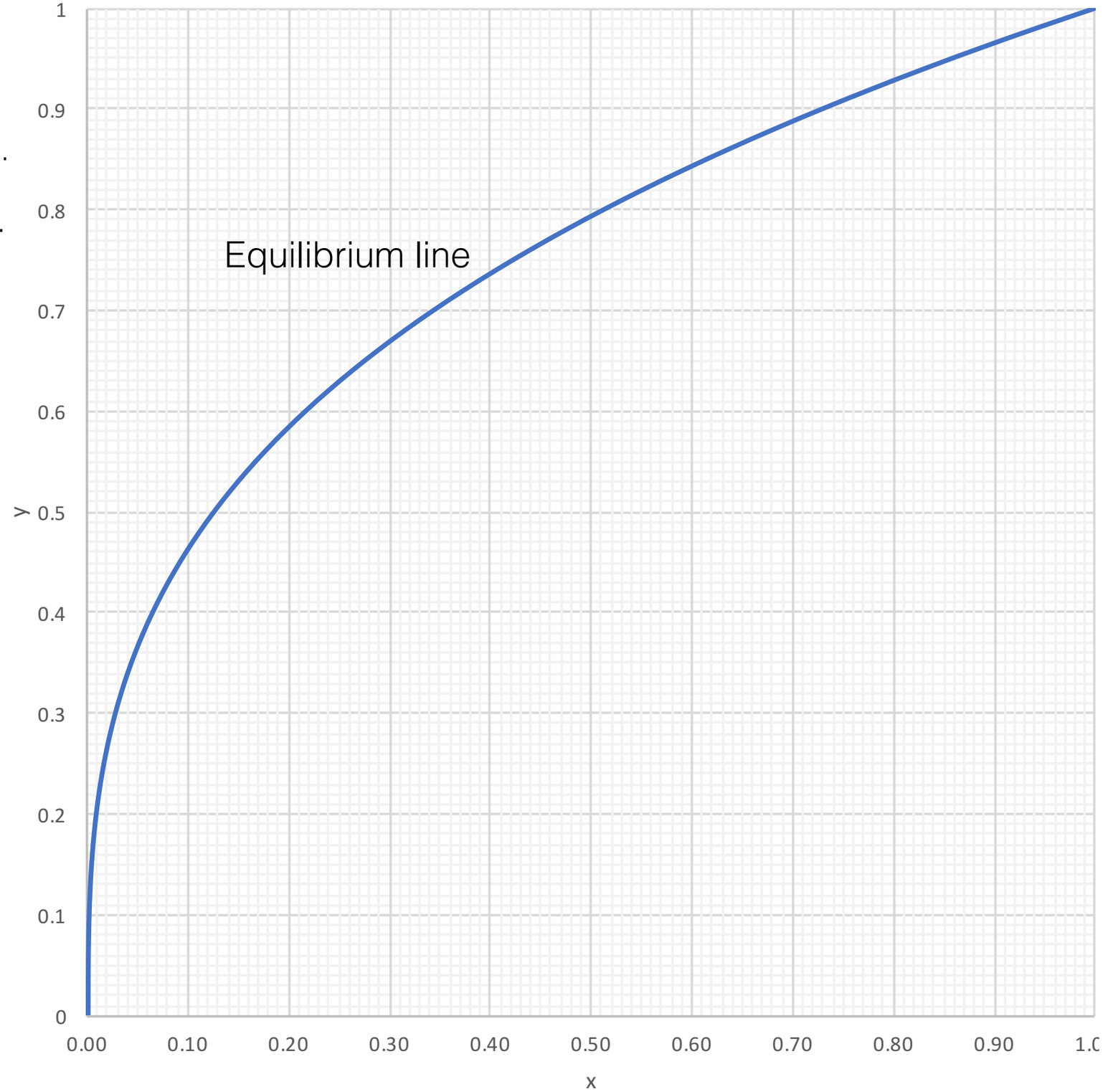


In-class Exercise problem

Consider the separation of binary mixture in saturated vapor state with a distillation column using partial condenser and a total reboiler. Feed flow rate (z_1 = 0.5) is 100 mol/hr. Your target is to recover 90% of the more volatile component (component 1) of the feed in the distillate. If reflux ratio is set to 1.5 times minimum reflux ratio, and D = 50 mole/hr, calculate:

1) Minimum reflux ratio.
2) Equation of rectifying section's operating line.
3) Total number of stages.
4) Highlight (x0, yD), (x1,y1), (x2, y3) in the plot.





$F = 100$ mole/hr

$z = 0.5$

Amount of component 1 in feed = 100 *0.5 = 50 mole/hr

Amount of component 1 in distillate = 50*0.9 = 45 mole/hr

$y_D = 45/50 = 0.9$

$$B = F - D = 100 - 50 = 50$$

$$Bx_B + Dy_D = Fz$$

$$\Rightarrow B = F\frac{y_D - z}{y_D - x_B}$$

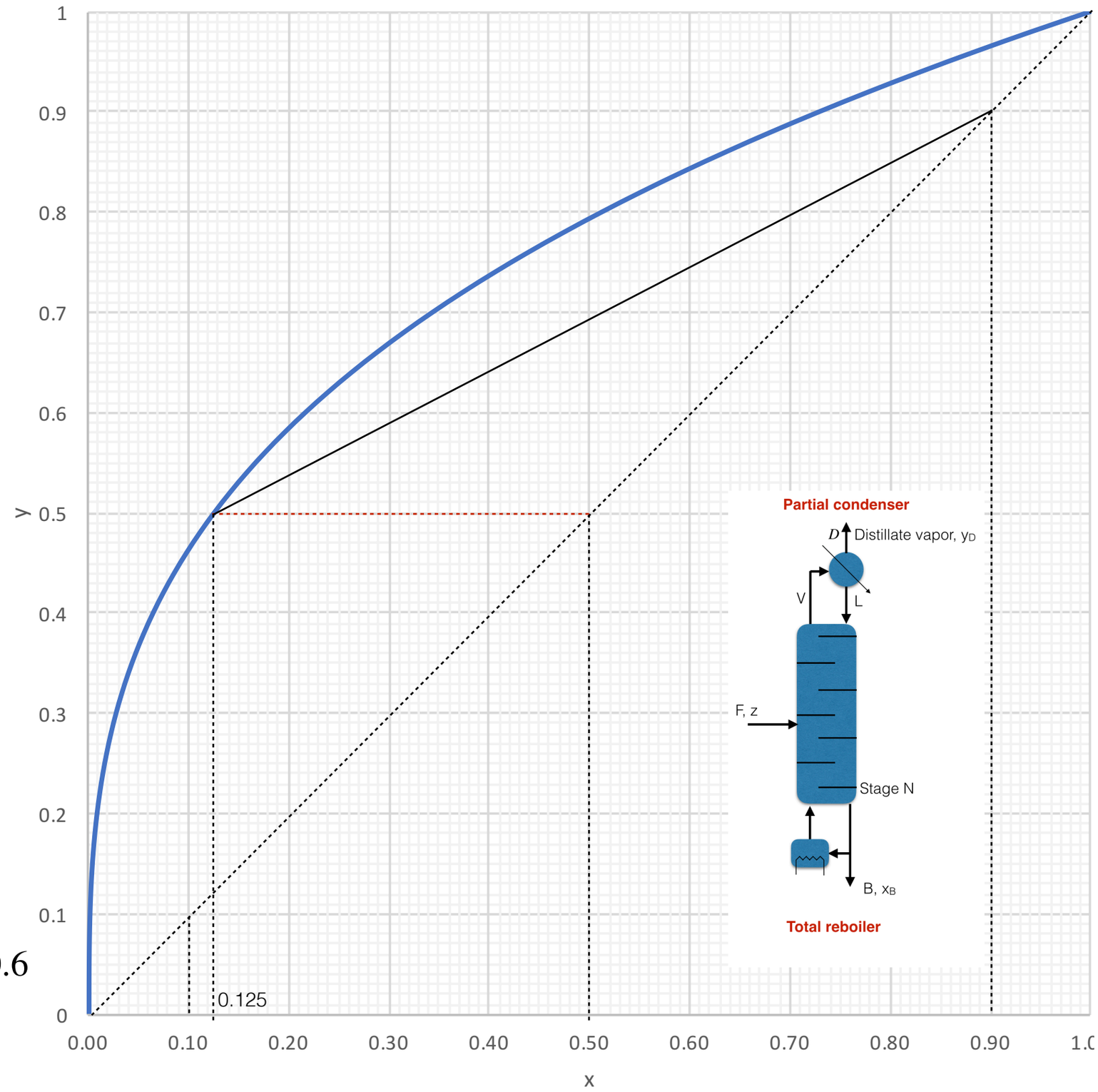
$x_B = 0.1$

Feed is saturated vapor; q = 0

$$\frac{R_{min}}{R_{min}+1} = \frac{0.90 - 0.5}{0.90 - 0.125} = 0.516$$

$$R_{min} = 1.066$$

$$R = 3R_{min} = 3.198 \qquad \Rightarrow \frac{R}{R+1} = 0.6$$



$$\Rightarrow \frac{R}{R+1} = 0.6$$

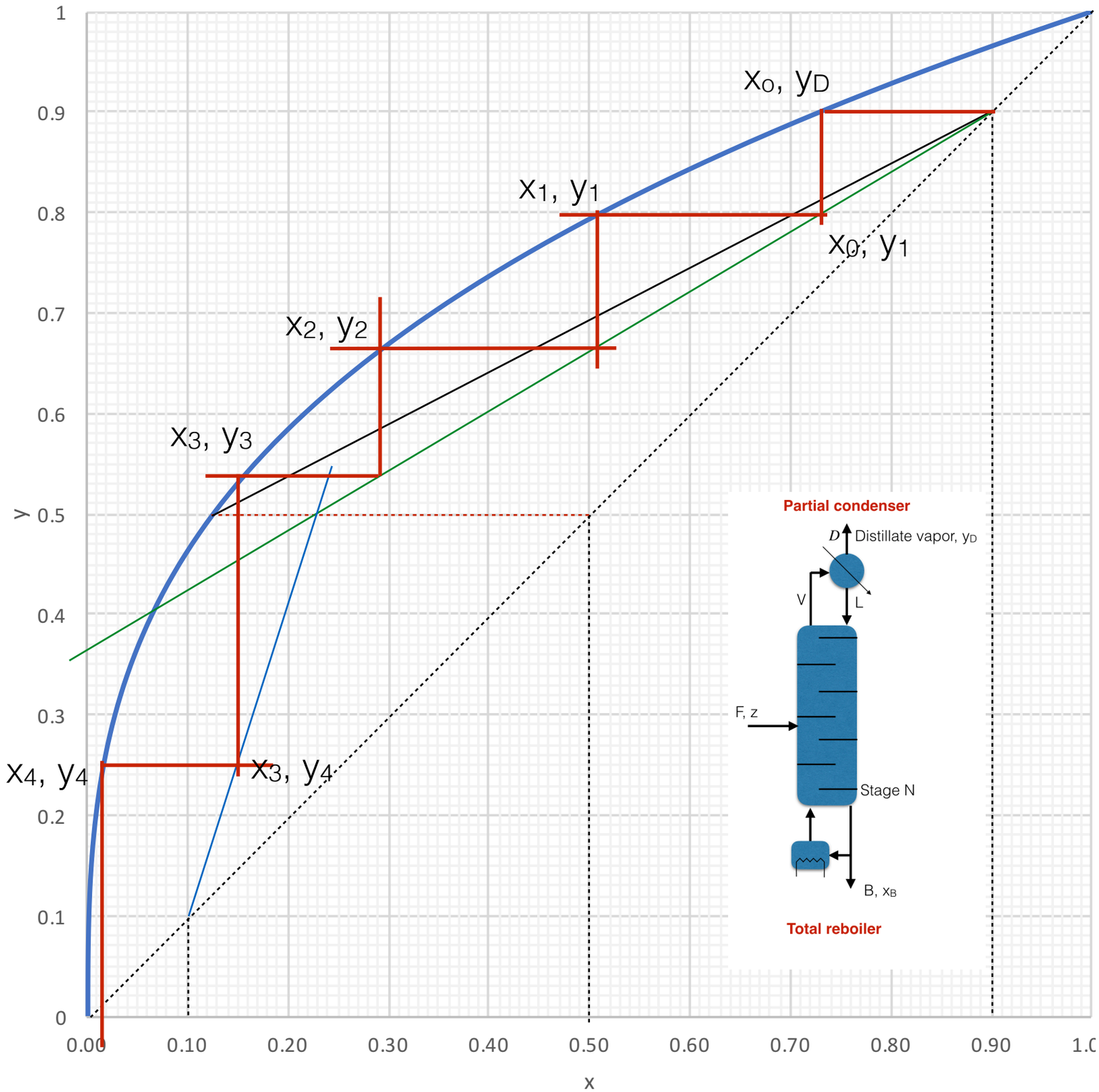
Operating line for rectifying section

$y = 0.6\,x + c$

$c = 0.9 - 0.6*0.9 = 0.36$

$y = 0.6x + 0.36$

Total number of stages = 5 (including partial condenser)



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