Name (Print) _____ ID No. _____

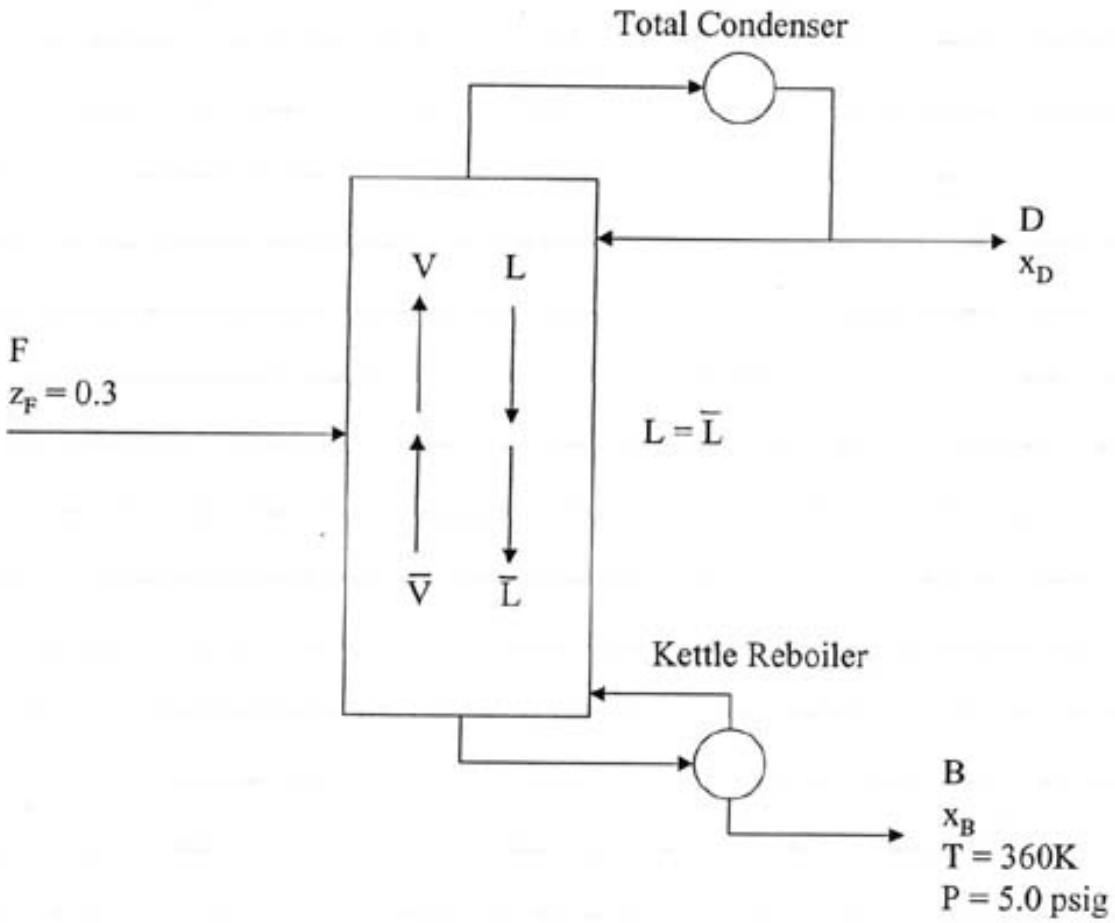
Signature _____

ChE 150 B November 6, 2002

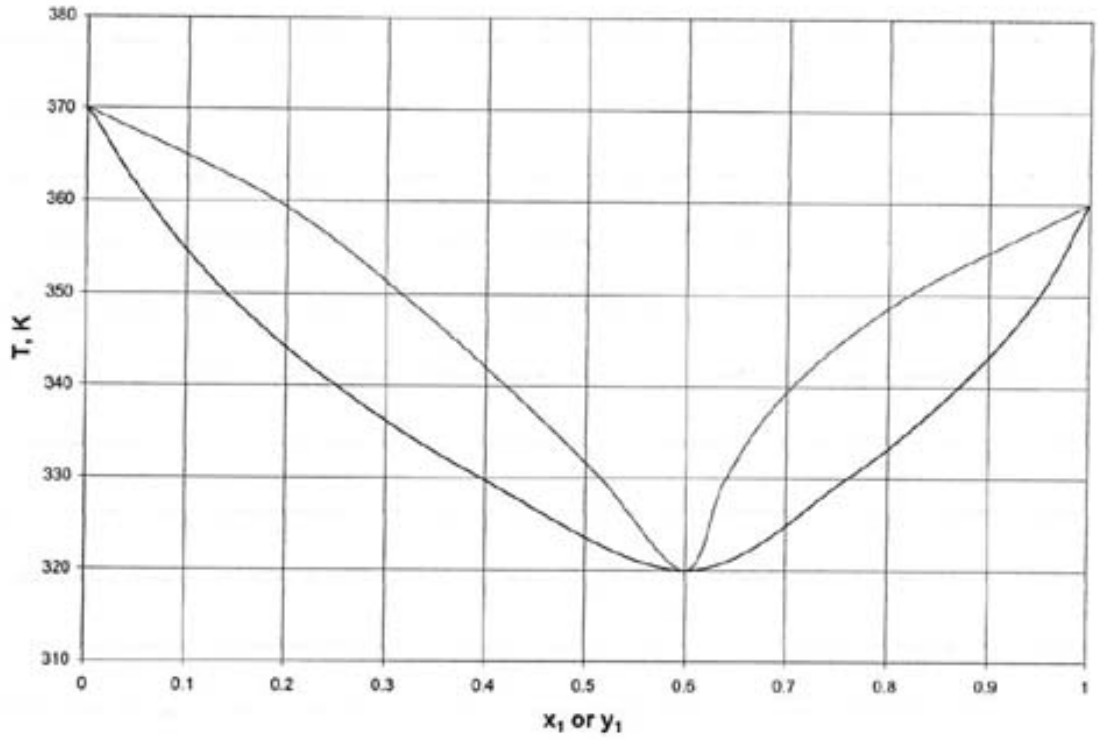
Midterm Examination II
(Closed Book, but One Page of Notes)
Answer all questions in the space provided after each question.

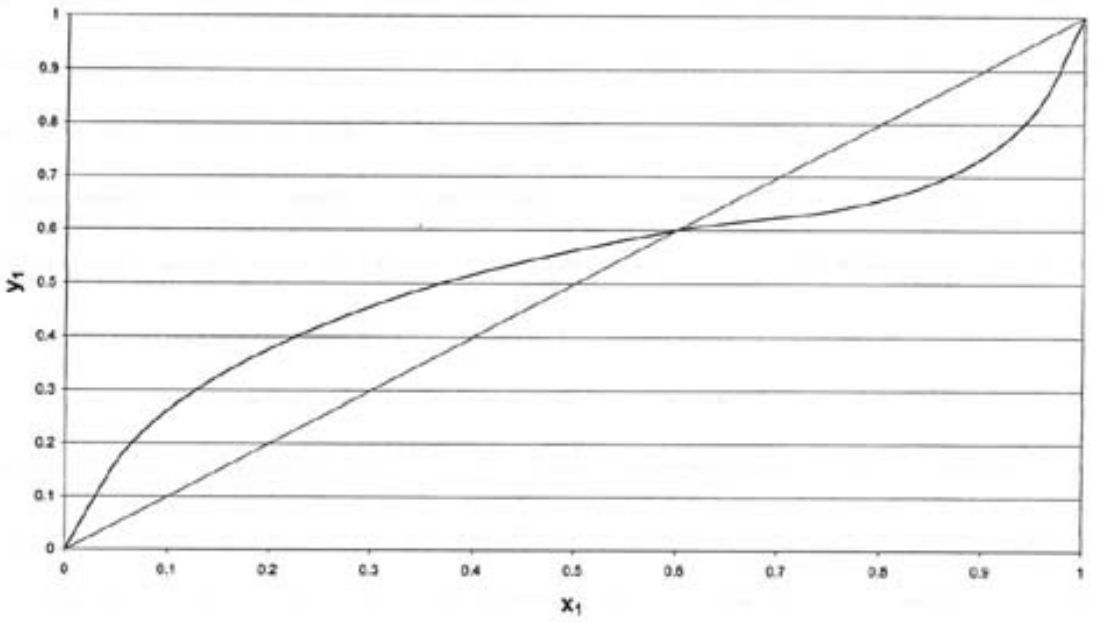
1. (70 pts.)

Consider the following setup:



A 2-component mixture of species 1 and 2 is to be distilled in the apparatus on the previous page. The mole fraction of component 1 in the feed is 0.3. Species 1 and 2 form a minimum boiling azeotrope as shown:





a. (6 pts.) What is the composition in the reboiler? Give a short explanation of your answer.

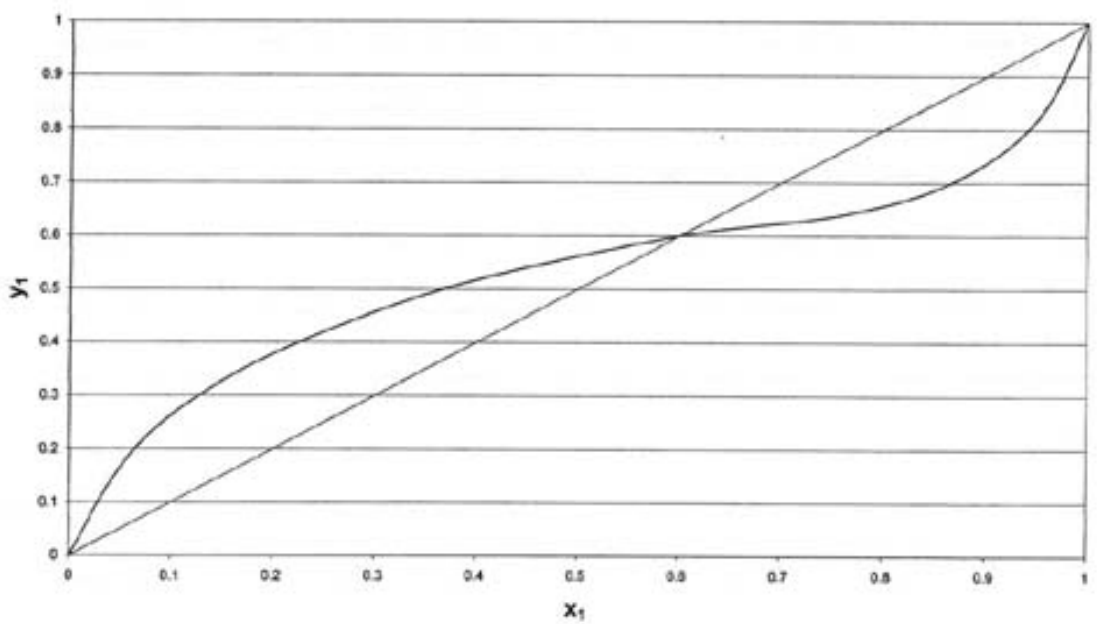
b. (6 pts.) What is the maximum purity of bottoms that can be obtained? Give a short explanation of your answer.

c. (6 pts.) What is the maximum purity of distillate that can be obtained? Give a short explanation of your answer.

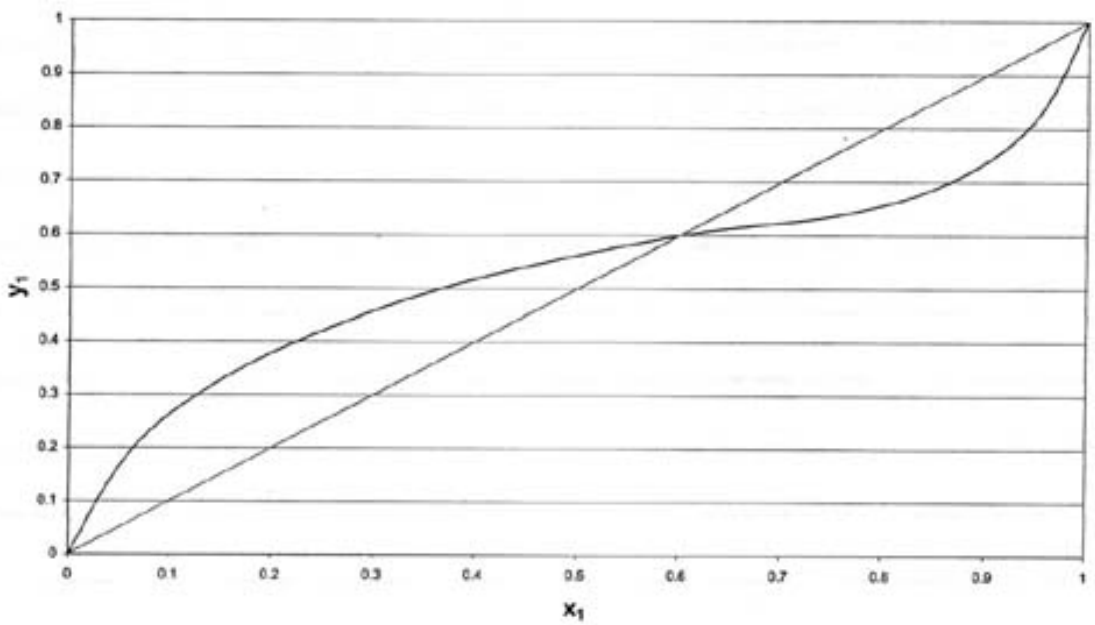
d. (8 pts.) Will a thermocouple in the distillate read greater than 360 K, 360 K, or less than 360 K? Give a short explanation of your answer.

e. (8 pts.) Will a pressure gauge in the distillate read greater than 5.0 psig, 5.0 psig, or less than 5.0 psig? Give a short explanation of your answer.

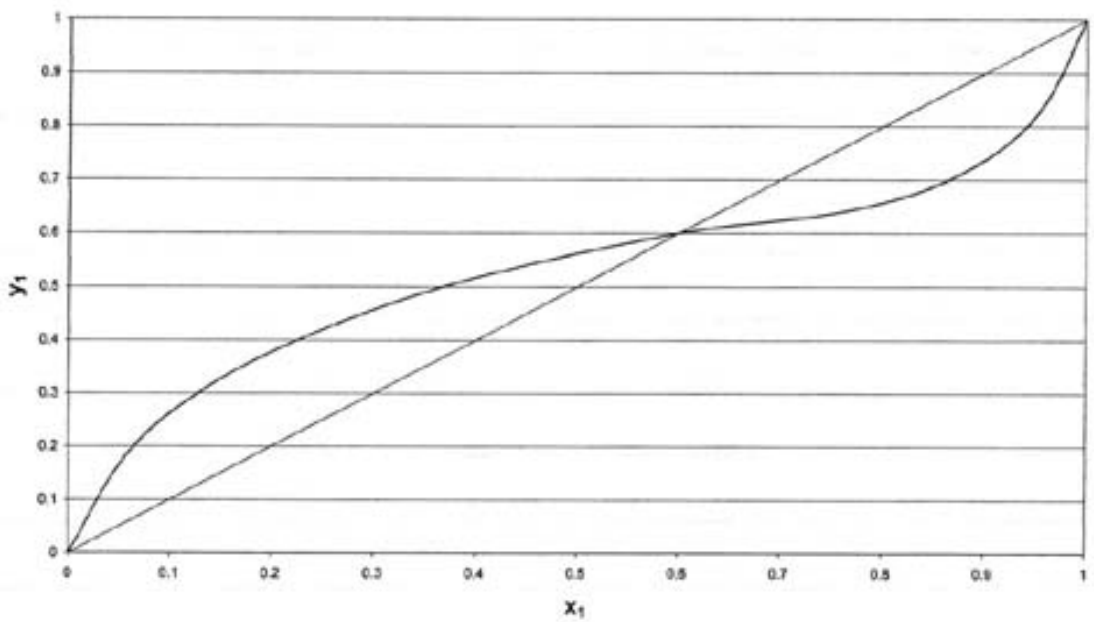
f. (12 pts.) If the distillate must be enriched in component A by 80% of the feed composition, what is the fewest number of trays required? Show all work below.



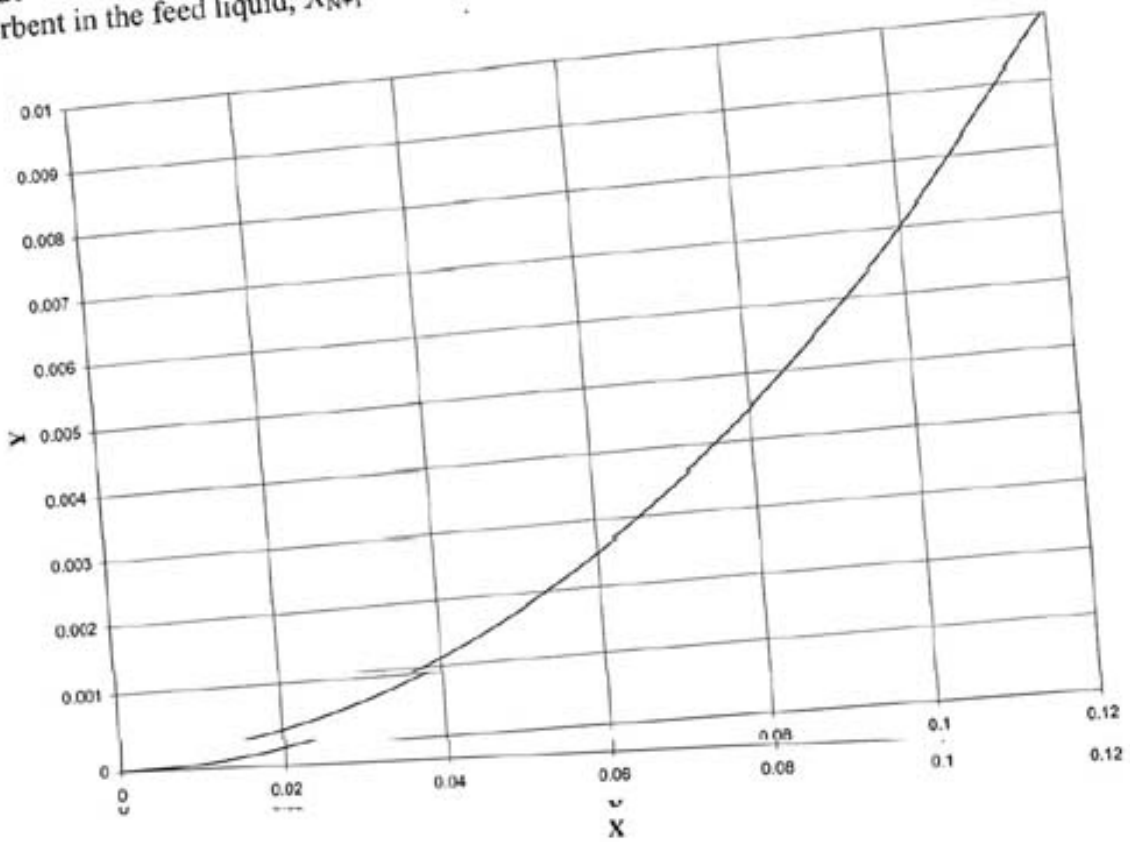
g. (12 pts.) For the conditions listed in part f, what is R_{min}? Show all work below.



h. (12 pts.) If $R = 1.3\ R_{min}$, and the optimum feed tray is used, how many trays are required to achieve the separation specified in part f? What is the optimum feed tray? Show all work below.



2. (30 pts.) A liquid containing an impurity is to be purified by stripping with a pure gas that does not contain any of the impurity. The mole ratio of solute to solute-free absorbent in the feed liquid, $X_{N+1} = 0.10$. Equilibrium data for the system is given below.



a. (10 pts.) What is $(G' / L')_{min}$, if $X_1 = 0.25\ X_{N+1}$? Show all work below, and on the chart above.

b. (20 pts.) If $(G' / L') = 1.5 * (G' / L')_{min}$, what is the value of Y_N at the top of the column? How many equilibrium stages are required for this separation? Show all work below.