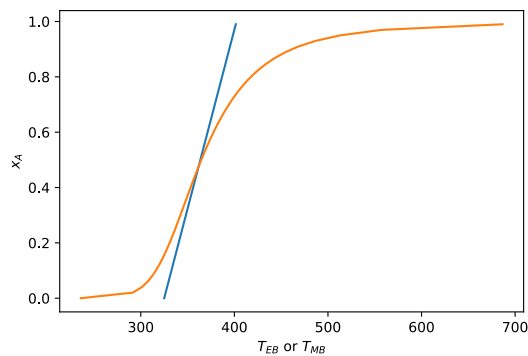


## Answers Tut 2

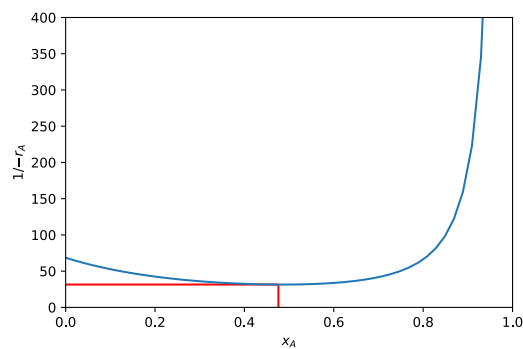
- 2.1
- a)  $x = 93.3\%$  OR  $2.2\%$  OR  $42.4\%$  (plot  $x$  vs  $T$  (mol balance) and  $x$  vs  $T$  (energy) balance to notice the multiplicity)
  - b)  $x = 97.7\%$  not multiple steady states any more
  - c) Increase inlet  $T$  by about  $20\text{ K}$  – conversion =  $96.2\%$
  - d)  $x = 0.3\%$  (almost nothing)
  - e)  $T_u = 539.6\text{ K}$  (Reactor Temperature =  $530\text{ K}$ )

## 2.2

- a) No multiplicity Plot:



- b) Operating  $T$  of  $RX_2$ :  $T_2 = 424\text{ K}$ ,  $V_{RX_2} = 68.03\text{ L}$  (Conversion of A after first reactor:  $x_A = 47.6\%$ ,  $T_1 = 361.8$ )
- c) Conversion in on PFR with  $V = 150\text{ L}$  and inlet conditions same as for  $CSTR_1$ :  $x_A = 31.03\%$  vs  $47.6\%$  - Explanation; Levenspiel!



- d)  $V_{CSTR} = 152.7\text{ L}$  ( $x_A = 48.5\%$ ) followed by PFR with  $V_{PFR} = 239.6\text{ L}$  Total volume =  $392.3\text{ L}$