Continuous Stirred Tank Reactor

objectives:
determine the kinetics of saponification reaction and measure residence time density $\Rightarrow (E$ curve)

Reaction:

$$NaOH + CH_3COOC_2H_5 \rightarrow CH_3COONa + C_2H_5OH$$

rate: $-r_A = k \cdot C_A^a C_B^b$

Part A: Assuming B in excess.

$$-r_A = k' C_A^a \rightarrow \text{(linearize.)}$$

$$\ln -r_A = \ln k' + a \ln C_A \rightarrow \text{(y)}$$

plot $\ln(-r_A)$ vs. $\ln C_A$

slope $= a$

$$-r_{NaOH} = \frac{\text{flow in} - \text{flow out}}{V(rct)} \rightarrow \text{mol/s}$$

flow in $\Rightarrow$ ~~moles of A~~ / ~~volumetric flow rate~~ $(C_{in\,A})(\dot{V}_{A\,in})$

flow out $\rightarrow$ $(C_{A\,out})(\dot{V}_{A\,out} + \dot{V}_{B\,out})$

Calculate the rest:

time density function: $E(t)$.

$$E(t) = \frac{(t)\,\theta}{\int E(t)\,dt} \leftarrow \text{constant from integration}$$

changing with time

↳ you can use trapezoidal