You are designing a reactor to carry out an irreversible reaction A → 2B + 2C. You want to determine the optimal type of reactor to use. You decide that you will have an inflow of material $F_{A0}$ = 300 mol/min. You have performed laboratory scale experiments and collected some data on the system:

| $X_A$ | 0 | 0.2 | 0.4 | 0.5 | 0.6 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|
| $-r_A$ [mol L$^{-1}$min$^{-1}$] | 2.0 | 3.2 | 9.5 | 10 | 8.5 | 2.5 | 2.0 |

**a.** Create a Jupyter notebook and use Python to construct a Levenspiel plot of the data. For all your plots, be sure to label the axes appropriately (don't forget units!), give it a title, and include a legend.

**b.** Carry out a least squares fit of the data and plot the experimental data and the fit.

**c.** You desire 60% conversion of the reactant. Compute the volume for a CSTR this would require. Compute the volume for a PFR this would require.

Suggestion: Use the `numpy.trapz()` function to find a numerical solution to the integral. (For more information on the function see the documentation available at https://docs.scipy.org/doc/numpy/reference/generated/numpy.trapz.html).

**d.** For each of the above points, describe what you are coding in Markup cells and explain why you believe this makes sense.

**e.** Print out the Jupyter notebook that you used to create your plots and calculate your values.