A First Course on Kinetics and Reaction Engineering

Problem 11.1

Problem Purpose

This problem will help you determine whether you have mastered the learning objectives for this unit.

Problem Statement

A reactor with a fluid volume of 10 L needs to be tested to determine whether it can be modeled accurately as an ideal CSTR. A steady flow of solvent at 25 L/min is established; there is no tracer in the solvent. Suddenly a valve is opened so that the flow into the reactor contains a tracer at a 3 M concentration. The data below (and in the accompanying Excel® workbook) were measured following the opening of the valve. Use these data to calculate the value of the age function for each measurement and plot the age function as a function of the fluid "age."

Time (min)	Outlet Tracer Conc. (M)
0	0.00
0.1	0.51
0.2	1.04
0.3	1.50
0.4	1.97
0.5	2.12
0.6	2.46
0.7	2.51
0.8	2.64
0.9	2.75
1	2.78
1.1	2.94
1.2	2.92
1.3	2.90
1.4	2.91
1.5	2.97
1.6	2.98
1.7	3.03
1.8	2.88
1.9	3.01
2	3.04