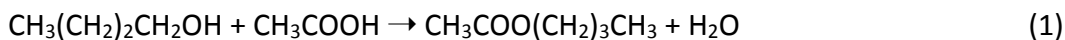


## AFCoKaRE Practice Problem 14.2 Solution

**Purpose:** This problem allows you to practice the differential analysis of kinetics data obtained using a batch reactor.

**Problem Statement:** Suppose three preliminary experiments involving the aqueous reaction of acetic acid (A) with excess butanol (B) to form butyl acetate (Z) and water (W), reaction (1) were performed using an agitated 500 mL round-bottomed flask as the reactor. All three experiments were performed at the same temperature; they differed in the initial concentrations of A and B. In each experiment the concentration of acetic acid was measured at increasing reaction times. The data are shown in Table 1. Using a differential data analysis, determine whether the second order rate expression in equation (2) is acceptably accurate. If it is, determine the best value of the rate coefficient, including 95% confidence limits.



$$r_1 = k_1 C_A^2 \quad (2)$$

	$C_{A,0} \text{ (M)}$	$C_{B,0} \text{ (M)}$	$t_f \text{ (min)}$	$C_A \text{ (M)}$
<b>Experiment 1</b>	0.5	2.5	10	0.46
	0.5	2.5	20	0.43
	0.5	2.5	30	0.4
	0.5	2.5	40	0.37
<b>Experiment 2</b>	1	10	10	0.85
	1	10	20	0.74
	1	10	30	0.66
	1	10	40	0.59
<b>Experiment 3</b>	2	10	10	1.48
	2	10	20	1.18
	2	10	30	0.98
	2	10	40	0.84

Table 1. Kinetics Data for AFCoKaRE Problem 14.2