## AFCoKaRE Practice Problem 6.3 Solution

<u>Purpose</u>: This problem allows you to practice determining whether there is a linear combination of steps in a mechanism that sums to give the corresponding non-elementary reaction and to practice writing an expression for the rate of a non-elementary reaction with respect to one of its reactants or products in terms of the rates of the steps in its mechanism.

<u>Problem Statement</u>: Reaction (1) is non-elementary; it has been proposed to occur via the mechanism consisting of reactions (2) through (5). Show that this is a valid mechanism and write an expression for the rate of reaction (1) with respect to  $I_2$ .

$$I_2 + HCOOCH_3 \rightleftharpoons HI + CH_3I + CO_2 \tag{1}$$

$$I_2 \rightleftharpoons 2 I \bullet$$
 (2)

$$\mathsf{HCOOCH}_3 + \mathsf{I} \bullet \rightleftharpoons \bullet \mathsf{COOCH}_3 + \mathsf{HI} \tag{3}$$

$$\bullet \mathsf{COOCH}_3 \rightleftharpoons \bullet \mathsf{CH}_3 + \mathsf{CO}_2 \tag{4}$$

$$\bullet CH_3 + I_2 \rightleftharpoons CH_3 I + I \bullet \tag{5}$$