



Figure 3.12. Hanes–Woolf plots for $E_0 = 0.015 \text{ g/l}$ and $E_0 = 0.00875 \text{ g/l}$ (Example 3.1).

Example 3.3

The hydrolysis of urea by urease is an only partially understood reaction and shows inhibition. Data for the hydrolysis of the reaction are given next.

Substrate concentration:	0.2 M		0.02 M	
	$1/v$	I	$1/v$	I
	0.22	0	0.68	0
	0.33	0.0012	1.02	0.0012
	0.51	0.0027	1.50	0.0022
	0.76	0.0044	1.83	0.0032
	0.88	0.0061	2.04	0.0037
	1.10	0.0080	2.72	0.0044
	1.15	0.0093	3.46	0.0059

where v = moles/l-min and I is inhibitor molar concentration.

- Determine the Michaelis–Menten constant (K'_m) for this reaction.
- What type of inhibition reaction is this? Substantiate the answer.
- Based on the answer to part b, what is the value of K_i ?

Solution A double-reciprocal plot of $1/v$ versus $1/[S]$ for inhibitor concentrations $I = 0, 0.0012, 0.0044$, and 0.006 indicates that the inhibition is noncompetitive (Fig. 3.13). From the x -axis intercept of the plot, $-1/K'_m = -13$ and $K'_m \approx 7.77 \times 10^{-2} \text{ M}$. For $[S] = 0.2 \text{ M}$ and $I = 0$ from the intercept of $1/V$ versus $1/S$, $1/v_m = 0.2$ and $V_m \approx 5 \text{ moles/l-min}$. For $I = 0.0012 \text{ M}$ and $[S] = 0.2 \text{ M}$, $v = 3 \text{ moles/l-min}$. Substituting these values in

$$v = \frac{V_m}{\left(1 + \frac{[I]}{K_I}\right) \left(1 + \frac{K'_m}{[S]}\right)}$$

gives $K_I = 6 \times 10^{-3} \text{ M}$.