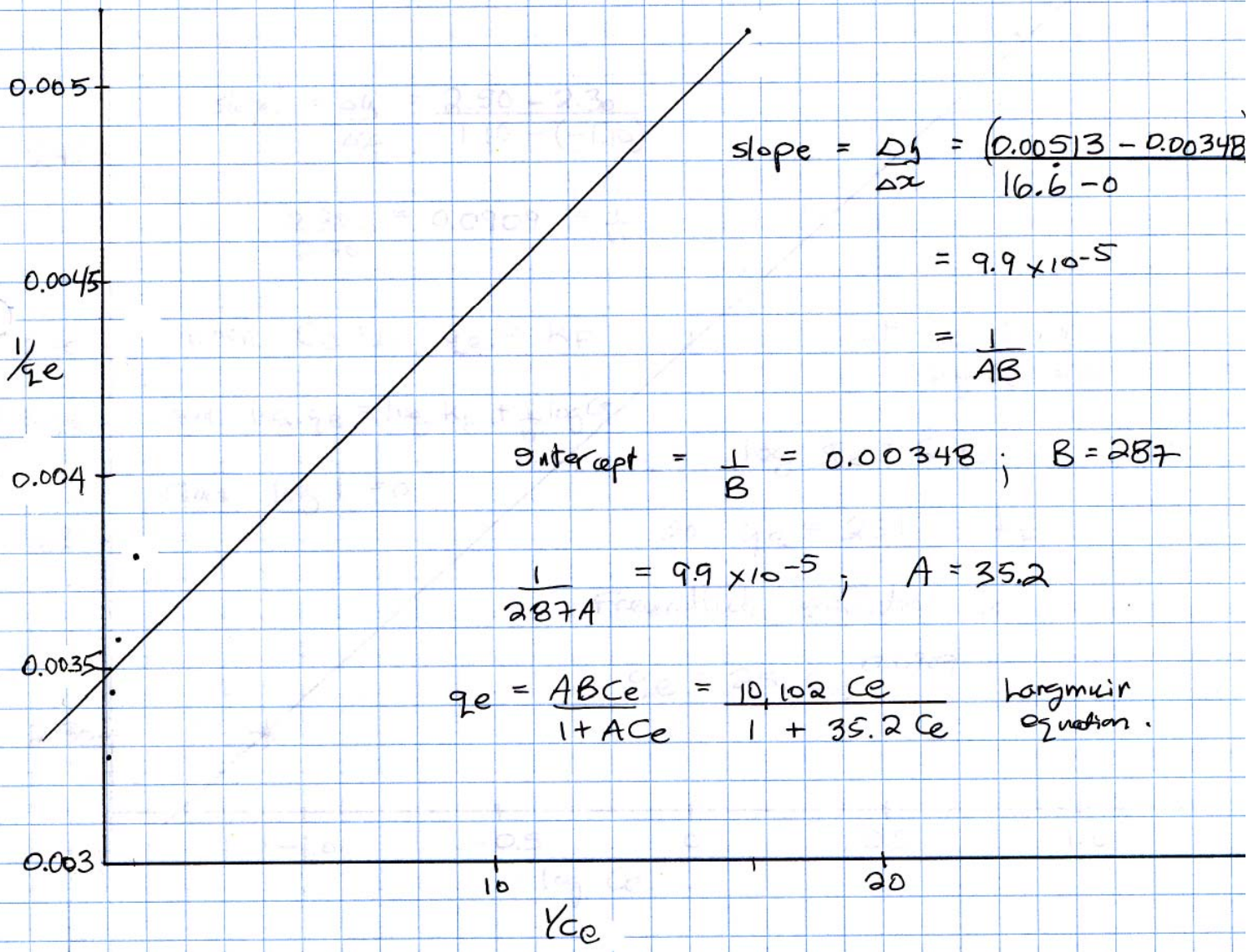
Pb^{2+} adsorbed – curve #1 Langmuir equation.

C_e mmol/L	0.06	1.35	3.23	5.07	6.85
q_e mmol/kg	195	264	280	291	305
X_e	16.6	0.741	0.310	0.197	0.146
Y_{q_e}	0.00513	0.00379	0.00357	0.00344	0.00327



$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{0.00513 - 0.00348}{16.6 - 0}$$

$$= 9.9 \times 10^{-5}$$

$$= \frac{1}{AB}$$

$$\text{intercept} = \frac{1}{B} = 0.00348 \; ; \quad B = 287$$

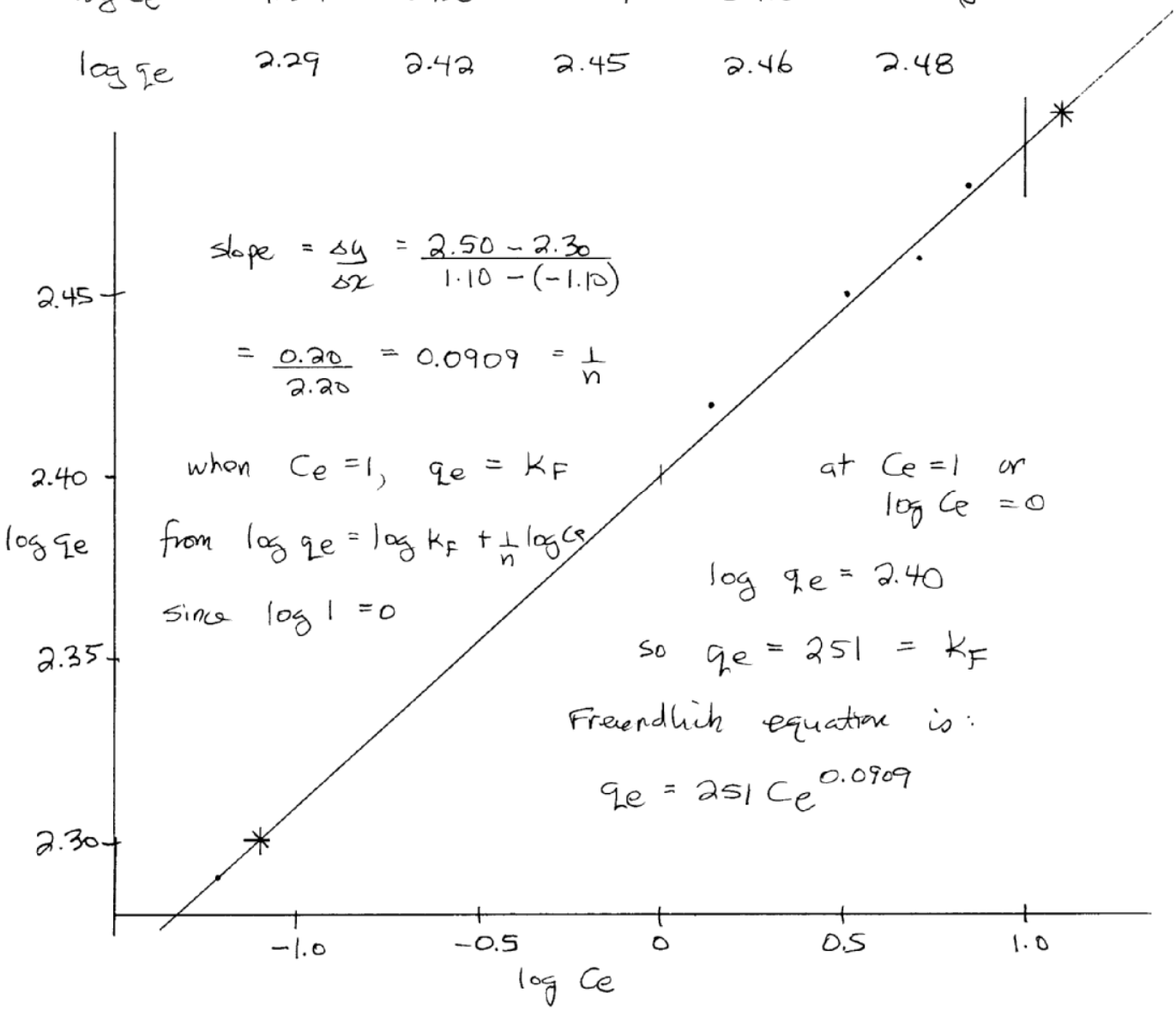
$$\frac{1}{287A} = 9.9 \times 10^{-5} \; ; \quad A = 35.2$$

$$q_e = \frac{ABC_e}{1 + AC_e} = \frac{10,102\, C_e}{1 + 35.2\, C_e}$$ Langmuir equation.

B = maximum predicted adsorption = 287 mmol/kg.

Freundlich equation.

C_e mmol/L	0.06	1.35	3.23	5.07	6.85
q_e mmol/L	195	264	280	291	305
$\log C_e$	−1.22	0.130	0.509	0.705	0.836
$\log q_e$	2.29	2.42	2.45	2.46	2.48



$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{2.50 - 2.30}{1.10 - (-1.10)}$$

$$= \frac{0.20}{2.20} = 0.0909 = \frac{1}{n}$$

when $C_e = 1$, $q_e = K_F$

at $C_e = 1$ or $\log C_e = 0$

from $\log q_e = \log K_F + \frac{1}{n} \log C_e$

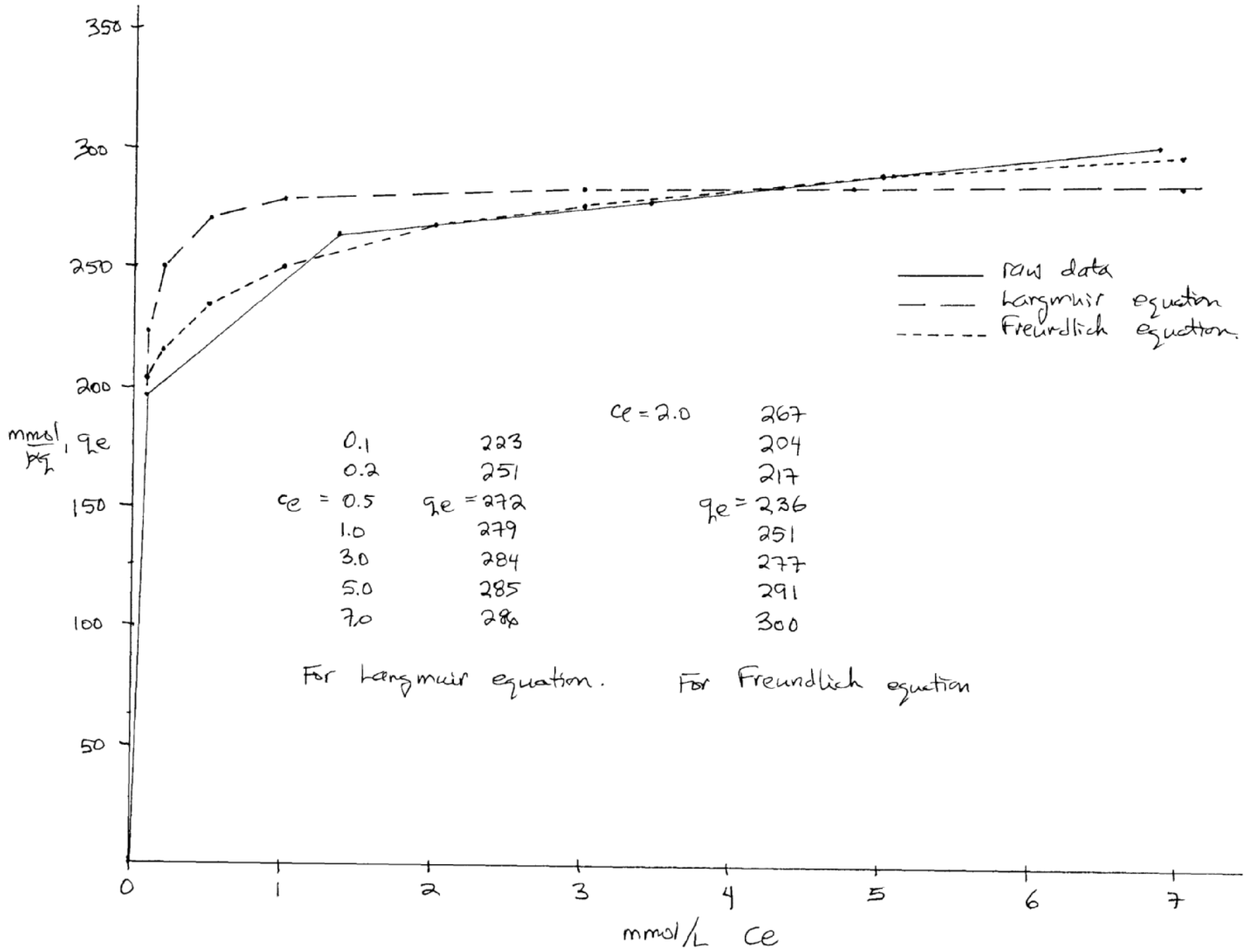
since $\log 1 = 0$

$\log q_e = 2.40$

so $q_e = 251 = K_F$

Freundlich equation is:

$$q_e = 251\, C_e^{0.0909}$$



Ce	qe
0.1	223
0.2	251
0.5	272
1.0	279
3.0	284
5.0	285
7.0	286

For Langmuir equation.

Ce	qe
2.0	267
	204
	217
	236
	251
	277
	291
	300

For Freundlich equation

Chemical #1 Acrylonitrile C_3H_3N molecular weight

$S = 76{,}800$ mg/L $= 3(12) + 3(1) + 14$

$= 53$ g/mole

$P_{vp} = 83$ mm Hg

$H = 1.1 \times 10^{-4}$ (atm·m³)/mole

$$P_{vp} = \frac{83 \text{ mm Hg}}{760 \text{ mm Hg/atm}} = 0.1092 \text{ atm}$$

$$S = \frac{76{,}800 \text{ mg/L}}{53 \text{ g/mole}} \times \frac{1000 \text{ L}}{\text{m}^3} \times \frac{\text{g}}{1000 \text{ mg}} = 1449 \frac{\text{moles}}{\text{m}^3}$$

$$H = \frac{P_{vp}}{S} = \frac{0.1092 \text{ atm}}{1449 \text{ moles/m}^3} = 7.536 \times 10^{-5} \text{ (atm·m}^3\text{)/mole}$$

$$= 0.7536 \times 10^{-4} \text{ (atm·m}^3\text{)/mole}$$

This value slightly less than 1.1×10^{-4} (atm·m³)/mole