Answer to case study 1

1.
You can use Excel or graph paper to plot the Ln(concentration) vs Time, then add the trendline. The slope of the trendline will be –Ke.
Or, you can use any of the two time points to determine Ke by the equation below:
Ke= -(LnC1-LnC2)/(t1-t2)=0.004153 /min

Cp(t)=Cp(0)*Exp(-Ke*t)
Cp(0)=Cp(t)*Exp(Ke*t)
Cp(0)=Cp(5)*Exp(Ke*5)=32.7*Exp(0.004153*5)=33.39mg/L

By trapezoidal rule ,
AUC(0-5)= (C0+C5)*5/2=165.25 mg*min/L
AUC(5-10) = 161.75 mg*min/L
AUC(10-15)= 158.25 mg*min/L
AUC(15-25)= 306.5 mg*min/L
AUC(25-50)= 713.75 mg*min/L
AUC(50-100)=1227.5 mg*min/L
AUC(100-150)= 995 mg*min/L
AUC(150-200) 807.5 mg*min/L
AUC(200-250)= 657.5 mg*min/L
AUC(250-300)= 533.75 mg*min/L
AUC(300-355)= 481.25 mg*min/L
AUC(355-400)= 320.625 mg*min/L
AUC(400-500)= 522.5 mg*min/L
AUC(500-600)= 344.5 mg*min/L
AUC(600-800)= 393 mg*min/L
AUC(800-1000)= 171 mg*min/L
AUC(1000-inf)= C1000/Ke=125.2172 mg*min/L
AUC(total) =8084.84mg*min/

2. Small V_d is due to very large plasma protein binding compared to tissue binding or the inability of a drug to cross membranes. The smallest (theoretical) V_d is 3L, the volume of plasma in the body.

3.
80% of plasma protein binding is used for calculation of Vd of normal people
Vd**=** Vp + Vt ***** Fu/Fu,t
Vd= 3 + 38* 0.2/0.7 = 13.86 L (normal patient)
In patients with chronic liver disease,
Fu=1-0.8*0.8=0.36
Vd= 3 + 38* 0.36/0.7 = 22.54 L