(18.9) Calculate β_4 and the distribution constant using (18.32) and Figure 18.9.

Use lower curve as the upper one is for very high concentration in the organic phase.

Eqn. (18.32) $D_M = K_{DC} * \beta_z [A^-]^z / \Sigma \beta_n [A^-]^n$

n_{max} in the sum must be 4 and z = 3.

As a first approximation assume that the denominator is dominated by the term $\beta_3[A^-]^3$ at the maximum D-value, i.e. $\log(D_M)$=0.1 and pA = 2.5. In this point we then have $D_M = K_{DC}$, i.e. $K_{DC}=10^{0.1}$.

At the highest pA values the denominator is dominated by the first term in the sum, i.e. $\beta_0[A\text{-}]^0 = 1$ per definition as β_0=1. Then we can approximate $D_M=K_{DC}*\beta_3[A\text{-}]^3$ at pA = 6.25 and $\log(D_M)$=-5. This permits us to calculate β_3.

Thus the following procedure yields first approximations for K_{DC} and β_4 that can be used as starting values for a least squares refinement.

At the maximum of the curve:

$logD_M := 0.1$	$K_{DC} := 10^{logD_M}$	$K_{DC} = 1.259$

At pA=6.25:

$pA := 6.25$	$A := 10^{-pA}$	$A = 5.623 \cdot 10^{-7}$
$logD_M := -5$	$D_M := 10^{logD_M}$	$D_M = 1 \cdot 10^{-5}$
$D_M = K_{DC} \cdot \beta_3 \cdot A^3$	$\beta_3 := \dfrac{D_M}{K_{DC} \cdot A^3}$	$\beta_3 = 4.467 \cdot 10^{13}$
		$\log(\beta_3) = 13.65$

At pA=0.5:

$pA := 0.5$	$A := 10^{-pA}$	$A = 0.316$
$logD_M := -1.1$	$D_M := 10^{logD_M}$	$D_M = 0.079$
$D_M = \dfrac{K_{DC} \cdot \beta_3 \cdot A^3}{\beta_3 \cdot A^3 + \beta_4 \cdot A^4}$	$\beta_4 := \dfrac{\beta_3 \cdot (K_{DC} - D_M)}{D_M \cdot A}$	$\beta_4 = 2.097 \cdot 10^{15}$
		$\log(\beta_4) = 15.32$