Solution to Problem Ch 1 #6

Let us consider the contributions to an amplitude factor by factor. First, the vertex factors

$$\prod_k \left(\frac{p^k}{f^2}\right)^{n_k}$$

Next, the pion propagators

$$\left(\frac{1}{p^2}\right)^{N_\pi}$$

Finally, the loop integrations

$$\left(p^4\right)^L$$

Hence,

$$D = \sum_k k n_k - 2N_\pi + 4L$$

Using the given equation

$$N\pi = L + \sum_k n_k - 1$$

By substituting this, we get

$$\begin{aligned} D &= \textstyle\sum_k k n_k - 2(L + \sum_k n_k - 1) + 4L \\ &= 2 + 2L + \textstyle\sum_k (k-2) n_k \end{aligned}$$