

## Aufgabe 26

$$S(u) = k_B (N \ln N - u \ln u - (N-u) \ln (N-u))$$

$$u_1 = 0.45N, \quad u_2 = 0.5N$$

$$u = qN$$

$$\begin{aligned} S(qN) &= k_B (N \ln N - qN \ln qN - (N-qN) \ln (N-qN)) \\ &= k_B (N \ln N - qN (\ln q + \ln N) - N(1-q) (\ln N + \ln(1-q))) \\ &= Nk_B \left( \underline{\ln N} - q \ln q - \underline{q \ln N} - \underline{(1-q) \ln N} - (1-q) \ln(1-q) \right) \\ &= Nk_B (-q \ln q - (1-q) \ln(1-q)) \end{aligned}$$

$$S(u_1) = 0.6881 Nk_B$$

$$S(u_2) = Nk_B \ln 2 = 0.6931 Nk_B$$

$$\Delta S = S(u_2) - S(u_1) = 0.0041 Nk_B \quad \frac{J}{K}$$