Problem C12.1 Compute the cubic (in h) term in the effective potential $V_{\text{eff}}(h)$ for the Standard Model. Include only the the SU(2) gauge bosons. Assume that h is small enough so that you can use the high-temperature expansion.
Hint: A massive vector field has 3 independent polarization states. Since the time components gets a Debye mass in addition to the h-dependent mass $m_W = gh/2$, they do not contribute to the cubic term. Only the remaining tow (transverse) components contribute.

Problem H12.1

(a) For the Bose-Einstein distribution f_B show that

$$f_B(\omega_1)f_B(\omega_2) = f_B(\omega_1 + \omega_2)\left[1 + f_B(\omega_1) + f_B(\omega_2)\right]$$

(b) Show that $f_B(\omega + i\pi T) = -f_F(\omega)$.

(c) Use the above results to show

$$f_F(p_0)\left[1 - f_F(E_k) + f_B(E_{k-p})\right] = f_F(E_k)f_B(E_{k-p})$$

when $p_0 = E_k + E_{k-p}$.