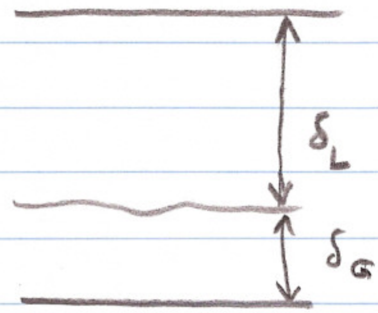
Problem 2.11 and 2.12



Starting from Eqs. (2.117) and (2.118) we must express ϕ_L' and ϕ_G' such that

$$\frac{d\phi_G'}{dz} = 0 \quad \text{at} \quad z = -\delta_G$$

$$\frac{d\phi_L'}{dz} = 0 \quad \text{at} \quad z = +\delta_L$$

Thus, instead of Eq. (2.117) use

$$\phi_L' = b\cosh[-k(z-\delta_L)]\,e^{i(\omega t - kx)}$$

and instead of Eq. (2.118) use

$$\phi_G' = b'\cosh[k(z+\delta_G)]\,e^{i(\omega t - kx)}$$

The result of the analysis will be similar to Eq. (2.129) except that ρ_L and ρ_G are

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replaced with ρ_L' and ρ_G' where

$$\rho_L' = \rho_L / \tanh(k\delta_L)$$

$$\rho_G' = \rho_G / \tanh(k\delta_G)$$

The neutral and the fastest growing wavelengths are found to be, when $U_L \to 0$ and $U_G \to 0$:

$$\lambda_{cr}' = 2\pi\lambda_L'$$

$$\lambda_d = 2\pi\sqrt{3}\,\lambda_L'$$

$$\lambda_L' = \sqrt{\frac{\sigma}{g(\rho_L' - \rho_G')}}$$