MEMO

1 $\psi = e^{ikz} + A e^{-ikz}$

$\psi' = ik e^{ikz} - A ik e^{-ikz}$

en $z=0$

$\psi = 1 + A$

$\psi' = ik[1 - A]$

2 $\psi = B e^{\alpha z} + C e^{-\alpha z}$

$\psi' = \alpha B e^{\alpha z} - \alpha C e^{-\alpha z}$

en $z=0$ $\psi = B + C$

$\psi' = \alpha [B - C]$

en $z=d$ $\psi = B e^{\alpha d} + C e^{-\alpha d}$

$\psi' = \alpha [B e^{\alpha d} - C e^{-\alpha d}]$

3 $\psi = D e^{ik(z-d)}$

$\psi' = ik D e^{ik(z-d)}$

en $z=d$ $\psi = D$

$\psi' = D ik$

$$\left\{\begin{aligned} &1 + A = B + C \\ &ik[1 - A] = \alpha[B - C] \\ &B e^{\alpha d} + C e^{-\alpha d} = D \\ &\alpha [B e^{-\alpha d} - C e^{-\alpha d}] = ikD \end{aligned}\right.$$

$$\left\{\begin{aligned} &ik[2 - B - C] = \alpha[B - C] \\ &B[ik + \alpha] = 2ik + C[\alpha - ik] \\ &C = D e^{\alpha d} - B e^{-2\alpha d} \\ &\alpha[B e^{\alpha d} - C e^{-\alpha d}] = ikD \end{aligned}\right.$$

MEMO

$$\begin{cases} B[ik+\alpha] = 2ik + (\alpha - ik)\{De^{\alpha d} - Be^{2\alpha d}\} \\ \alpha[Be^{\alpha d} - D + Be^{\alpha d}] = ik D \end{cases}$$

$$2B\alpha e^{\alpha d} = D(ik+\alpha)$$

$$D[ik+\alpha]^2 = 2ik\, 2\alpha e^{\alpha d} + [\alpha - ik] \times \{2\alpha e^{2\alpha d} D - e^{2\alpha d}(ik+\alpha)\}$$

$$D\{[\alpha+ik]^2 - [\alpha - ik]\}\{2\alpha - ik - \alpha\} e^{2\alpha d} = 4\alpha ik\, e^{\alpha d}$$

$$D\{(\alpha+ik)^2 - (\alpha-ik)^2 e^{2\alpha d}\} = 4ik\, e^{\alpha d}$$

$$D = \frac{4\alpha ik}{(ik+\alpha)^2 e^{-\alpha d} - (\alpha - ik)^2 e^{\alpha d}}$$

$$= \frac{4\alpha ik}{2(\alpha^2 - k^2)\,\mathrm{sh}\,\alpha d + 4i\alpha k \cosh \alpha d}$$

$$= \frac{1}{\cosh \alpha d + \frac{\alpha^2 - k^2}{2ik\alpha}\,\mathrm{sh}\,\alpha d}$$

$$|D|^2 = \frac{1}{\cosh^2 \alpha d + \frac{(\alpha^2 - k^2)^2}{4\alpha^2 k^2}\,\mathrm{sh}^2 \alpha d}$$

$$= \frac{1}{1 + \left[1 + \frac{(\alpha^2 - k^2)^2}{4\alpha^2 k^2}\right]\mathrm{sh}^2 \alpha d}$$

$$= \frac{1}{1 + \frac{\alpha^2 + k^2}{4\alpha^2 k^2}\,\mathrm{sh}^2 \alpha d}$$