In[230]:=
```
S = e^(-i*Φ*π) (e^(i*k*π) - e^(-i*k*π))^-1 *
   {{e^(i*k*π) e^(-i*Φ*π) - e^(-i*k*π) e^(i*Φ*π),
     e^(-i*k*π) e^(-i*Φ*π) - e^(-i*k*π) e^(i*Φ*π)},
    {e^(i*k*π) e^(-i*Φ*π) - e^(i*k*π) e^(i*Φ*π),
     e^(-i*k*π) e^(-i*Φ*π) - e^(i*k*π) e^(i*Φ*π)}}

Psi[x_] = k*e^(-i*Φ*x)*{e^(i*k*x), e^(-i*k*x)}
Phi[x_] = k*e^(i*Φ*x)*{e^(i*k*x), e^(-i*k*x)}

PPsi[x_] = k*e^(-i*Φ*x)*{e^(i*k*x), -e^(-i*k*x)}
PPhi[x_] = k*e^(i*Φ*x)*{e^(i*k*x), -e^(-i*k*x)}

PPsi[0].{Cp1, Cm1} + PPhi[0].S.{Cp1, Cm1}
PPsi[π].{Cp0, Cm0} + PPhi[π].S.{Cp0, Cm0} - i*α*Psi[π].{Cp0, Cm0}

PPsi[0].{Cp1, Cm1} + PPhi[0].S.{Cp1, Cm1} ==
 PPsi[π].{Cp0, Cm0} + PPhi[π].S.{Cp0, Cm0} - i*α*Psi[π].{Cp0, Cm0}

Psi[π].{Cp0, Cm0} == Psi[0].{Cp1, Cm1}
Solve[Psi[π].{Cp0, Cm0} == Psi[0].{Cp1, Cm1} &&
   PPsi[0].{Cp1, Cm1} + PPhi[0].S.{Cp1, Cm1} ==
    PPsi[π].{Cp0, Cm0} + PPhi[π].S.{Cp0, Cm0} - i*α*Psi[π].{Cp0, Cm0}, {Cp1, Cm1}]

(*S[k,Φ].{x,y}=={a,b}*)
 Solve[%,{x,y}]*)
```

Out[230]=
$$\left\{\left\{\frac{e^{-i\pi\Phi}\left(e^{ik\pi-i\pi\Phi}-e^{-ik\pi+i\pi\Phi}\right)}{-e^{-ik\pi}+e^{ik\pi}},\ \frac{e^{-i\pi\Phi}\left(e^{-ik\pi-i\pi\Phi}-e^{-ik\pi+i\pi\Phi}\right)}{-e^{-ik\pi}+e^{ik\pi}}\right\},\right.$$
$$\left.\left\{\frac{e^{-i\pi\Phi}\left(e^{ik\pi-i\pi\Phi}-e^{ik\pi+i\pi\Phi}\right)}{-e^{-ik\pi}+e^{ik\pi}},\ \frac{e^{-i\pi\Phi}\left(e^{-ik\pi-i\pi\Phi}-e^{ik\pi+i\pi\Phi}\right)}{-e^{-ik\pi}+e^{ik\pi}}\right\}\right\}$$

Out[231]= $\left\{e^{ikx-ix\Phi}k,\ e^{-ikx-ix\Phi}k\right\}$

Out[232]= $\left\{e^{ikx+ix\Phi}k,\ e^{-ikx+ix\Phi}k\right\}$

Out[233]= $\left\{e^{ikx-ix\Phi}k,\ -e^{-ikx-ix\Phi}k\right\}$

Out[234]= $\left\{e^{ikx+ix\Phi}k,\ -e^{-ikx+ix\Phi}k\right\}$

Out[235]=
$$-Cm1\,k + Cp1\,k + Cm1\left(\frac{e^{-i\pi\Phi}\left(e^{-ik\pi-i\pi\Phi}-e^{-ik\pi+i\pi\Phi}\right)k}{-e^{-ik\pi}+e^{ik\pi}} - \frac{e^{-i\pi\Phi}\left(e^{-ik\pi-i\pi\Phi}-e^{ik\pi+i\pi\Phi}\right)k}{-e^{-ik\pi}+e^{ik\pi}}\right) +$$
$$Cp1\left(\frac{e^{-i\pi\Phi}\left(e^{ik\pi-i\pi\Phi}-e^{-ik\pi+i\pi\Phi}\right)k}{-e^{-ik\pi}+e^{ik\pi}} - \frac{e^{-i\pi\Phi}\left(e^{ik\pi-i\pi\Phi}-e^{ik\pi+i\pi\Phi}\right)k}{-e^{-ik\pi}+e^{ik\pi}}\right)$$

Out[236]=
$$-\text{Cm0}\, e^{-i k \pi - i \pi \Phi} k + \text{Cp0}\, e^{i k \pi - i \pi \Phi} k + \text{Cm0} \left(\frac{e^{i k \pi} \left(e^{-i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i k \pi} \left(e^{-i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) + \text{Cp0} \left(\frac{e^{i k \pi} \left(e^{i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i k \pi} \left(e^{i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) - i \left(\text{Cm0}\, e^{-i k \pi - i \pi \Phi} k + \text{Cp0}\, e^{i k \pi - i \pi \Phi} k \right) \alpha$$

Out[237]=
$$-\text{Cm1}\, k + \text{Cp1}\, k + \text{Cm1} \left(\frac{e^{-i \pi \Phi} \left(e^{-i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i \pi \Phi} \left(e^{-i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) + \text{Cp1} \left(\frac{e^{-i \pi \Phi} \left(e^{i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i \pi \Phi} \left(e^{i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) == -\text{Cm0}\, e^{-i k \pi - i \pi \Phi} k + \text{Cp0}\, e^{i k \pi - i \pi \Phi} k + \text{Cm0} \left(\frac{e^{i k \pi} \left(e^{-i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i k \pi} \left(e^{-i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) + \text{Cp0} \left(\frac{e^{i k \pi} \left(e^{i k \pi - i \pi \Phi} - e^{-i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} - \frac{e^{-i k \pi} \left(e^{i k \pi - i \pi \Phi} - e^{i k \pi + i \pi \Phi} \right) k}{-e^{-i k \pi} + e^{i k \pi}} \right) - i \left(\text{Cm0}\, e^{-i k \pi - i \pi \Phi} k + \text{Cp0}\, e^{i k \pi - i \pi \Phi} k \right) \alpha$$

Out[238]=
$$\text{Cm0}\, e^{-i k \pi - i \pi \Phi} k + \text{Cp0}\, e^{i k \pi - i \pi \Phi} k == \text{Cm1}\, k + \text{Cp1}\, k$$

Out[239]=
$$\left\{ \left\{ \text{Cp1} \to -\frac{1}{2} e^{-i k \pi - i \pi \Phi} \left(-2\, \text{Cp0}\, e^{2 i k \pi} + \text{Cm0}\, i\, \alpha + \text{Cp0}\, e^{2 i k \pi}\, i\, \alpha \right), \text{Cm1} \to \frac{1}{2} e^{-i k \pi - i \pi \Phi} \left(2\, \text{Cm0} + \text{Cm0}\, i\, \alpha + \text{Cp0}\, e^{2 i k \pi}\, i\, \alpha \right) \right\} \right\}$$