2.7. Green's function

$$iG(x,x') = \langle 0|[\phi(x), \phi'(x)]|0\rangle \tag{2.65}$$

$$G^{(1)}(x,x') = \langle 0|\{\phi(x), \phi'(x)\}|0\rangle \tag{2.66}$$

$$\left.\begin{aligned} iG &= G^{+} - G^{-} \\ G^{(1)} &= G^{+} + G^{-} \end{aligned}\right\} \tag{2.67}$$

$$\begin{aligned} iG_F(x,x') &= \langle 0|T(\phi(x), \phi(x'))|0\rangle \\ &= \theta(t-t')\, G^{+}(x,x') \\ &\quad + \theta(t'-t)\, G^{-}(x,x') \end{aligned} \tag{2.69}$$

$$\left.\begin{aligned} G^{+}(x,x') &= \langle 0|\phi(x)\phi(x')|0\rangle \\ G^{-}(x,x') &= \langle 0|\phi(x')\phi(x)|0\rangle \end{aligned}\right\} \tag{2.68}$$

$$\left.\begin{aligned} G_R(x,x') &= -\theta(t-t')\, G(x,x') \\ G_A(x,x') &= \theta(t'-t)\, G(x,x') \end{aligned}\right\} \tag{2.70}$$

$$\bar{G}(x,x') = \frac{1}{2}\left[G_R(x,x') + G_A(x,x')\right] \qquad (2.71)$$

$$G_F(x,x') = -\bar{G}(x,x') - \frac{1}{2} i G^{(1)}(x,x') \qquad (2.72)$$

$$(2.73)$$

$$\left(\Box_x + m^2\right) \mathcal{G}(x,x') = 0$$

where $\mathcal{G}(x,x') = G, G^{(1)}, G^{\pm}$

Using $\partial_t \theta(t-t') = \delta(t-t')$

$$\left(\Box_x + m^2\right) G_F(x,x') = -\delta^{(n)}(x-x') \qquad (2.74)$$

$$\left(\Box_x + m^2\right) G_{R,A}(x,x') = \delta^{(n)}(x-x') \qquad (2.75)$$