

$$Z = X \times Y \xrightarrow{F} \mathbb{R}$$

$$\underline{\mathcal{L}}_F=0$$

$$F(xy) = f(x)g(y)$$

$$\begin{aligned}\underline{\mathcal{L}}_F = \Delta &= \Delta_X \boxtimes \mathfrak{i}_Y + \mathfrak{i}_X \boxtimes \Delta_Y \text{ second/first order diff op} \\ &\quad \text{tangential}\end{aligned}$$

$$\Phi(xy) = \sum_n \varphi_n(x) \psi_n(y)$$

$$\Delta_Y \psi_n = \lambda_n \psi_n$$

$$\begin{aligned}0 = \underline{\mathcal{L}}_F \Phi = \Delta \Phi &= \sum_n \underbrace{\Delta_X \varphi_n \boxtimes \psi_n}_{\Delta_X \varphi_n \boxtimes \psi_n} + \underbrace{\varphi_n \boxtimes \Delta_Y \psi_n}_{\varphi_n \boxtimes \lambda_n \psi_n} = \sum_n \underbrace{\Delta_X \varphi_n \boxtimes \psi_n}_{\Delta_X + \lambda_n} + \underbrace{\varphi_n \boxtimes \lambda_n \psi_n}_{\text{free}} = \sum_n \underbrace{\Delta_X + \lambda_n}_{\Delta_X + \lambda_n} \varphi_n \boxtimes \underbrace{\psi_n}_{\text{free}} \\ &\Rightarrow \underbrace{\Delta_X + \lambda_n}_{\Delta_X + \lambda_n} \varphi_n = 0 \Rightarrow \Delta_X \varphi_n = -\lambda_n \varphi_n \text{ mass} \\ &\Rightarrow \text{massless spec } \Phi(xy) = \varphi^i(x) \psi_i(y) : \psi_i \in \ker \Delta_Y \\ &\Rightarrow X \xrightarrow[\sigma \text{ model}]{\varphi^i} \ker \Delta_Y \text{ fin dim}\end{aligned}$$