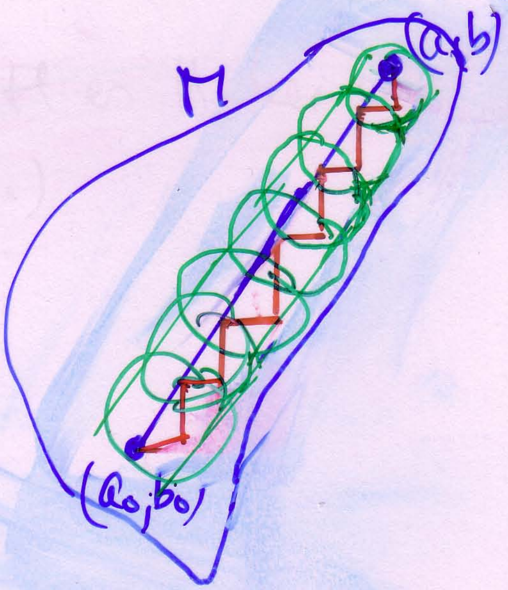
5. Für alle $(a,b) \in M$ gibt es Hakenweg Γ von (a_0,b_0) nach (a,b)



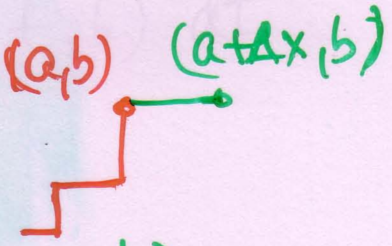
Bew: Kompaktheit der Strecke (a_0,b_0), (a,b)

6. Def $\varphi(a,b) = \int_\Gamma F \cdot d\vec{x}$

unabhängig von Γ Bew 4.

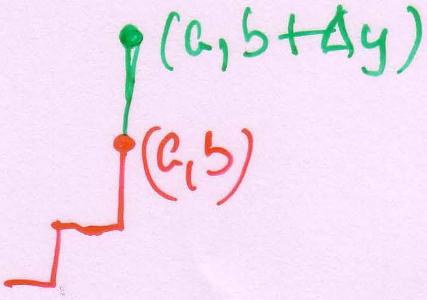
7. $\frac{\partial \varphi}{\partial x}(a,b) = F_1(a,b)$

$$= \lim_{\Delta x \to 0} \frac{1}{\Delta x} \int_a^{a+\Delta x} F_1(t,b)\,dt$$



$$= \frac{\partial}{\partial x} \int F_1(t,b)\,dt\,(a) = F_1(a,b)$$

8. $\frac{\partial \varphi}{\partial y}(a,b) = F_2(a,b)$



$$= \lim_{\Delta y \to 0} \frac{1}{\Delta y} \int_b^{b+\Delta y} F_2(a,t)\,dt$$

$$= \frac{\partial}{\partial y} \int F_2(a,t)\,dt\,(b) = F_2(a,b)$$