1 Rubber Sheet

Consider a hanging rectangular rubber sheet. We will consider there to be two ways to get energy into or out of this sheet: you can either stretch it vertically or horizontally. The vertical dimension of the rubber sheet we will call y, and the horizontal dimension of the rubber sheet we will call x. We can use these two independent variables to specify the "state" of the rubber sheet. Similiar to the partial derivative machine, we could choose any pair of variables from the set $\{x, y, F_x, F_y\}$ to specify the state of the rubber sheet.

If I pull the bottom down by a small distance Δy, with no horizontal force, what is the resulting change in width Δx? Express your answer in terms of partial derivatives of the potential energy $U(x, y)$.