$$\frac{d}{dt}\left\{\begin{pmatrix}\partial_{v_x}\\\partial_{v_y}\\\partial_{v_z}\end{pmatrix}K\right\} \implies \begin{aligned}m\frac{dv_x}{dt}&=-\frac{\partial U}{\partial x}\\[1em]m\frac{dv_y}{dt}&=-\frac{\partial U}{\partial y}\\[1em]m\frac{dv_z}{dt}&=-\frac{\partial U}{\partial z}\end{aligned} \impliedby \begin{pmatrix}\partial_x\\\partial_y\\\partial_z\end{pmatrix}(-U)$$