Partial derivatives as a *rate of change*:

Let $z = f(x, y)$ then

$\frac{\partial z}{\partial x}$ is the rate of change of z w.r.t. x when y is held fixed.

$\frac{\partial z}{\partial y}$ is the rate of change of z w.r.t. y when x is held fixed.

Marginal Cost

Suppose a manufacturer produces x units of product X and y units of product Y. Then the total cost $\mathcal{C}$ of these units, $\mathcal{C} = f(x, y)$ is called a **joint cost function**.

$\frac{\partial \mathcal{C}}{\partial x}$ is called the **(partial) marginal cost with respect to** x.

(rate of change in $\mathcal{C}$ w.r.t. x when y is held fixed.)

$\frac{\partial \mathcal{C}}{\partial y}$ is called the **(partial) marginal cost with respect to** y.

(rate of change in $\mathcal{C}$ w.r.t. y when x is held fixed.)