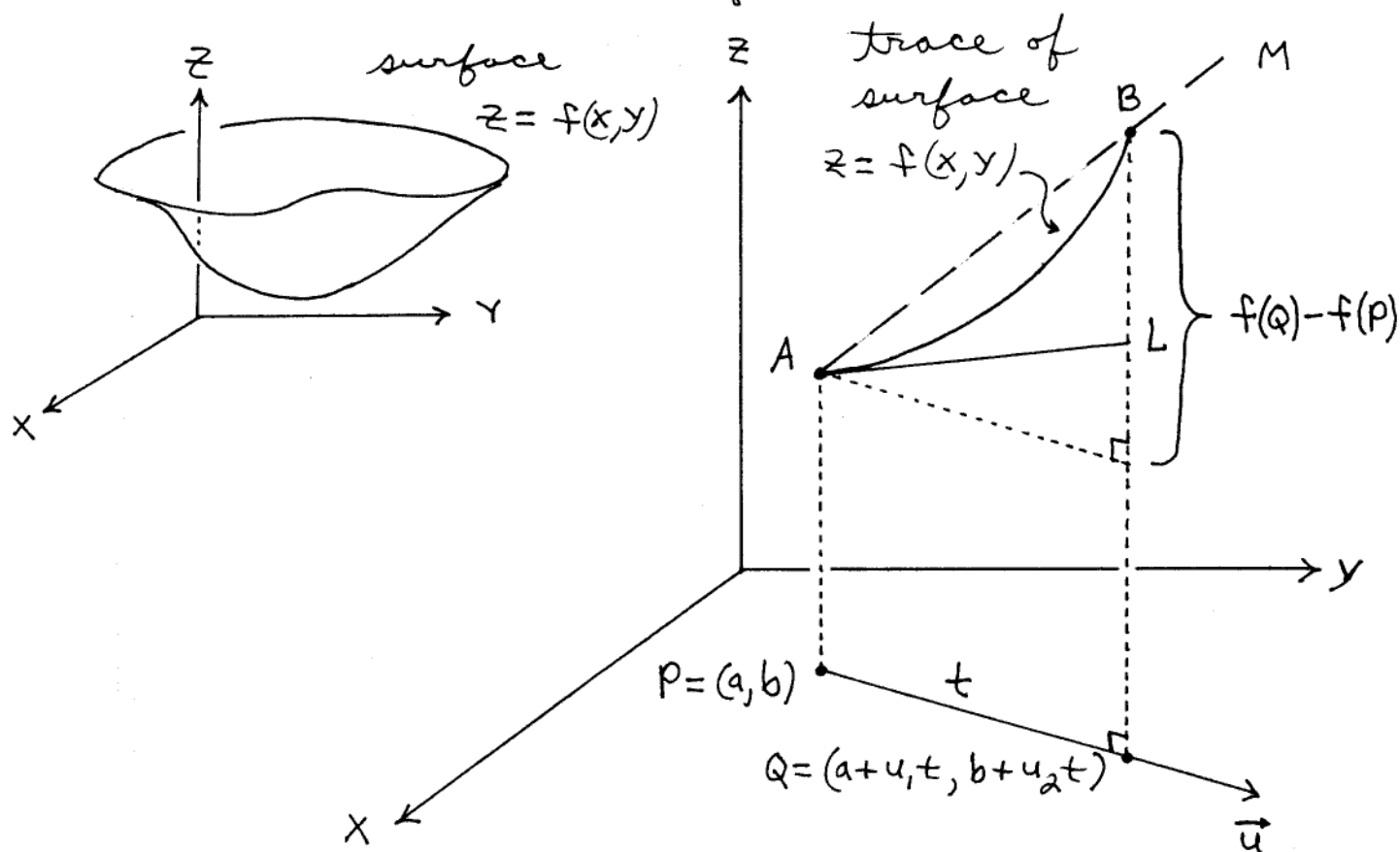


Math 21C

Kouba

Directional Derivatives and Gradient Vectors

Consider a surface given by the function $z = f(x, y)$, a point $P = (a, b)$, and a unit vector $\vec{u} = u_1 \vec{i} + u_2 \vec{j}$. We seek to define the derivative of f at point P in the direction of \vec{u} :



Remarks:

1.) Let point $Q = (a + u_1 t, b + u_2 t)$, where $t \geq 0$.

2.) Vector $\vec{PQ} = (u_1 t, u_2 t) = t(u_1, u_2) = t\vec{u}$

points in the direction of \vec{u} and has length t since \vec{u} is a unit vector.