1 Lecture 1: January 6, 2023

An alternative formulation of the triangle inequality:
$\|x-y\| \geq \|x\| - \|y\|$

2 Lecture 2: January 10, 2023

In 1D, the derivative of a function f at $x_0 \in \mathbb{R}$ is defined as
$f'(x_0) = \lim_{x\to x_0} \dfrac{f(x)-f(x_0)}{x-x_0}$
If this limit exists, we say f is **differentiable** at x_0.
To prepare our transition into multiple dimensions, we can rewrite the above equation as:
$\lim_{x\to x_0} \dfrac{f(x)-f(x_0)}{x-x_0} - f'(x_0) = 0$
Or,
$\lim_{x\to x_0} \dfrac{f(x)-f(x_0)-f'(x_0)(x-x_0)}{x-x_0} = 0$
This is the same as questioning the existence of an $L = f'(x_0)$ that satisfies:
$\lim_{x\to x_0} \dfrac{f(x)-f(x_0)-L(x-x_0)}{x-x_0} = 0$