

# Lecture 23 - UM 102 (Spring 2021)

Vamsi Pritham Pingali

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# Recap

- Limit and continuity laws (

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 $g(t) = \|\vec{a}\|^2 + t^2\|\vec{v}\|^2 + 2t\langle\vec{a}, \vec{v}\rangle$ .

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- Moreover,  $\nabla_{s\vec{v}}f(\vec{a})$  exists whenever  $\nabla_{\vec{v}}f(\vec{a})$  does and equals  $s\nabla_{\vec{v}}f(\vec{a})$ : Indeed, let  $h(t) = f(\vec{a} + t\vec{v})$  and  $g(t) = h(st) = f(\vec{a} + ts\vec{v})$ . Then by the chain rule  $g'(0)$  exists and equals  $sh'(0) = s\nabla_{\vec{v}}f(\vec{a})$ .
- If  $f(\vec{x}) = \|\vec{x}\|^2$ , compute  $\nabla_{\vec{v}}f(\vec{a})$ :  
 $g(t) = \|\vec{a}\|^2 + t^2\|\vec{v}\|^2 + 2t\langle\vec{a}, \vec{v}\rangle$ . Thus  $g'(0) = 2\langle\vec{a}, \vec{v}\rangle$ .

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