

THE LIMIT

$$(*) \Leftrightarrow \forall h \neq 0, \frac{g(f(a)+h) - g(f(a))}{h} = g'(f(a)) + \varepsilon(h)$$

(exercise)

with $\lim_{h \rightarrow 0} \varepsilon(h) = 0$.

$$\Rightarrow \forall h, g(f(a)+h) = g(f(a)) + h g'(f(a)) + h \varepsilon(h).$$