proof of sum rule

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$$\frac{\mathrm{d}}{\mathrm{d}x}\left[f(x)+g(x)\right] = \lim_{h\to 0}\frac{f(x+h)+g(x+h)-f(x)-g(x)}{h}$$

$$= \lim_{h\to 0}\left[\frac{f(x+h)-f(x)}{h}+\frac{g(x+h)-g(x)}{h}\right]$$

$$= f'(x)+g'(x)$$