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Lista da Semana 7

1) a) $\lim_{x \to 2} \frac{\sqrt{x^2+5}-3}{x^2-4}$

$\begin{cases} u = \sqrt{x^2+5} \\ u^2 = x^2+5 \to u^2-5 = x^2 \end{cases}$

$x \to 2 \Rightarrow u \to 3$

$\lim_{u \to 3} \frac{u-3}{u^2-9} \Rightarrow \frac{u-3}{(u+3)(u-3)} \Rightarrow \frac{1}{u+3} \Rightarrow \boxed{\frac{1}{6}}$

b) $\lim_{x \to 1} \frac{\sqrt[3]{x+7}-2}{x-1}$

$u = \sqrt[3]{x+7} \to u^3 = x+7 \to x = u^3-7$

$x \to 1 \Rightarrow u \to 2$

$\lim_{u \to 2} \frac{u-2}{u^3-8} \Rightarrow \frac{u-2}{u^3-2^3} \Rightarrow \frac{u-2}{(u-2)(u^2+2u+4)} \Rightarrow \frac{1}{u^2+2u+4}$

$\lim_{u \to 2} \frac{1}{u^2+2u+4} = \boxed{\frac{1}{12}}$

c) $\lim_{x \to 0} \frac{\operatorname{sen}(10x)}{5x} \Rightarrow \lim_{x \to 0} 2 \cdot \frac{\operatorname{sen}(5x)}{5x} \Rightarrow 2 \cdot 1 = 2$

d) $\lim_{x \to 0} \frac{\operatorname{sen} 2x \cdot \operatorname{tg} x}{2x^2} \Rightarrow \frac{\frac{d}{dx}(\operatorname{sen} 2x \cdot \operatorname{tg} x)}{\frac{d}{dx} \cdot 2x^2} = \lim_{x \to 0} \left(\frac{4 \operatorname{sen} 2x \cdot \cos x \cdot \operatorname{sen} x}{4x \cdot \cos(x^2)} \right) = 4$

e) $\lim_{x \to 0} \frac{\operatorname{sen}(5x)}{\cos 5x} = \frac{\operatorname{sen} 5 \cdot 0}{\cos 0} = 0$

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f) $\lim_{x\to\infty}\left(1+\frac{1}{2x}\right)^{6x}$ $\lim_{u\to\infty}\left(1+\frac{1}{u}\right)^{3u}=e^3$ $2x=u$

g) $\lim_{x\to\infty}\left(\frac{x+4}{x}\right)^{x} \Rightarrow \left(\frac{x}{x}+\frac{4}{x}\right)^{x} \Rightarrow \left(1+\frac{4}{x}\right)^{x}$ $\begin{cases}\frac{4}{x}=\frac{1}{u} \Rightarrow x=4u \Rightarrow u=\frac{x}{4}\\ \frac{\infty}{4}=\infty\end{cases}$

$\lim_{u\to\infty}\left(1+\frac{1}{u}\right)^{4u}=e^4$