Dussapio (Ajudante 2)
P1 - 300

Calcule o seguinte limite:

$$\lim_{x \to 5} \frac{x^{200} - 25^{100}}{x^{100} - 5x^{99} + x - 5}$$

Tentando substituir o x por 5

$$\frac{5^{200} - 2\,5^{100}}{5^{100} - 5 \cdot 5^{99} + 5 - 5} = \frac{5^{200} - (5^2)^{100}}{5^{100} - 5^{100} + 0} = \frac{5^{200} - 5^{200}}{5^{100} - 5^{100}} = \frac{0}{0}$$

$\frac{0}{0}$ = Indeterminação

$ax + bx + ay + by$
$x(a+b) + y(a+b)$
$(a+b) \cdot (x+y)$

$$\Rightarrow \lim_{x \to 5} \frac{x^{200} - 2\,5^{100}}{x^{100} - 5x^{99} + x - 5} = \lim_{x \to 5} \frac{x^{200} - 5^{200}}{(x-5)(x^{99}+1)} = \lim_{x \to 5} \frac{(x^{100})^2 - (5^{100})^2}{(x-5)(x^{99}+1)}$$

$$(x^{100} - 5x^{99}) + (x-5) \quad x^{99}(x-5) + (x-5) \quad (x-5)(x^{99}+1) = ax + a \quad \cup \quad a(x+1)$$

$$= \lim_{x \to 5} \frac{(x^{100} - 5^{100})(x^{100} + 5^{100})}{(x-5)(x^{99}+1)}$$

$$= \lim_{x \to 5} \frac{(x-5)(x^{99} \cdot 5^0 + x^{98} \cdot 5^1 + x^{97} \cdot 5^2 \ldots x^0 \cdot 5^{99})(x^{100} + 5^{100})}{(x-5)(x^{99}+1)}$$

$$= \lim_{x \to 5} \frac{(x^{99} \cdot 5^0 + x^{98} \cdot 5^1 + x^{97} \cdot 5^2 \ldots x^0 \cdot 5^{99})(x^{100} + 5^{100})}{x^{99}+1}$$

$$= \lim_{x \to 5} \frac{\sum_{n=0}^{99} (x^{99-n} \cdot 5^n) \cdot (x^{100} + 5^{100})}{x^{99}+1}$$

$$x^{99-n} = \frac{x^{99}}{x^n}$$

$$= \lim_{x \to 5} \frac{\sum_{n=0}^{99} \left(x^{99} \cdot \left(\frac{5}{x}\right)^n\right) \cdot (x^{100} + 5^{100})}{x^{99}+1}$$

$$\frac{x^{99}}{x^n} \cdot 5^n = x^{99} \cdot \frac{5^n}{x^n} = \left(x^{99} \cdot \left(\frac{5}{x}\right)^n\right)$$

$$= \lim_{x \to S} x^{99} \sum_{n=0}^{99} \left(\frac{S}{x}\right)^n \cdot \frac{\left(x^{100} + S^{100}\right)}{\left(x^{99} + 1\right)}$$

$$= S^{99} \cdot \sum_{n=0}^{99} \left(\frac{S}{S}\right)^n \cdot \frac{\left(S^{100} + S^{100}\right)}{S^{99} + 1}$$

$$= S^{99} \cdot \sum_{n=0}^{99} 1^n \cdot \frac{2 \cdot S^{100}}{S^{99} + 1}$$

$S^{100} + S^{100} = 2(S^{100})$

$$= \frac{S^{99} \cdot 100 \cdot 2 \cdot S^{100}}{S^{99} + 1}$$

$\sum_{n=0}^{99} 1^n = 0$ a $99 = 100$ ou $1 \cdot 100 = 100$

$$= \frac{S^{99} \cdot 200 \cdot S^{100}}{S^{99} + 1} = \frac{S^{199} \cdot 200}{S^{99} + 1}$$

$$= \frac{200 \cdot S^{199}}{S^{99}\left(1 + \frac{1}{S^{99}}\right)}$$

$S^{99} + 1 = S^{99}\left(1 + \frac{1}{S^{99}}\right)$

$S^{99} \cdot \frac{S^{99}}{S^{99}} = S^{99+1}$

$$= \frac{200 \cdot S^{100}}{1 + \frac{1}{S^{99}}} = \frac{200 \cdot S^{100}}{1 + \approx 0}$$

$\frac{1}{S^{99}} = 0{,}0000\ldots1 = \approx 0$

$$= \frac{200 \cdot S^{100}}{1} = \approx 200 \cdot S^{100}$$

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Link de acesso:

https://create.kahoot.it/share/calculo-1/30aca040-91d5-48e2-b7a1-87b2d25d48a8