Tarea 3

Metodos Matemáticos II

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1.- Utilice la siguiente grafica para calcular

a. $\lim\limits_{x \to 12^+} f(x)$,
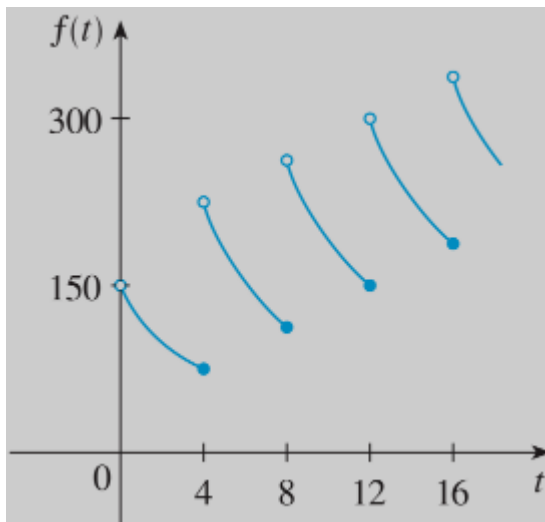
b. $\lim\limits_{x \to 12^-} f(x)$

Figura 1: Grafica para pregunta 1

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a. $\lim\limits_{x \to 12^+} f(x) = 300$

b. $\lim\limits_{x \to 12^-} f(x) = 150$

Calcule los siguientes límites laterales. Use estos resultados para determinar si el límite existe.

2.- $\lim\limits_{x \to 0^+} 1/(1 + e^{1/x})$ y $\lim\limits_{x \to 0^-} 1/(1 + e^{1/x})$

$$\lim_{x \to 0^+} \frac{1}{1 + e^{1/x}} = \frac{\lim\limits_{x \to 0^+} 1}{\lim\limits_{x \to 0^+} 1 + e^{1/x}}$$

$$\frac{\lim\limits_{x \to 0^+} 1}{\lim\limits_{x \to 0^+} e^{1/x}} = \frac{1}{1 + e^{1/\infty}}$$

$$\frac{\lim\limits_{x \to 0^+} 1}{\lim\limits_{x \to 0^+} e^{1/x}} = \frac{1}{1 + \infty} = 0$$

$$\frac{\lim\limits_{x \to 0^+} 1}{\lim\limits_{x \to 0^+} e^{1/x}} = \frac{1}{\infty} = 0$$

$$\lim_{x \to 0^+} \frac{1}{1 + e^{1/x}} = 0$$

$$\lim_{x \to 0^-} \frac{1}{1 + e^{1/x}} = \frac{\lim\limits_{x \to 0^-} 1}{\lim\limits_{x \to 0^-} e^{1/x}}$$

$$\frac{\lim\limits_{x \to 0^-} 1}{\lim\limits_{x \to 0^-} e^{1/x}} = \frac{1}{1 + e^{1/-\infty}}$$

$$\frac{\lim\limits_{x \to 0^-} 1}{\lim\limits_{x \to 0^-} e^{1/x}} = \frac{1}{1 + \dfrac{1}{e^\infty}}$$

$$\frac{\lim\limits_{x \to 0^-} 1}{\lim\limits_{x \to 0^-} e^{1/x}} = \frac{1}{1 + \dfrac{1}{\infty}}$$

$$\frac{\lim\limits_{x \to 0^-} 1}{\lim\limits_{x \to 0^-} e^{1/x}} = \frac{1}{1 + 0} = 1$$

$$\lim_{x \to 0^-} \frac{1}{1 + e^{1/x}} = 1$$

3.- $\lim\limits_{x \to -1^+} f(x)$ y $\lim\limits_{x \to -1^-} f(x)$, donde

$$f(x) = \begin{cases} 1 + x & x < -1 \\ x^2 & -1 \le x < 1 \\ 2 - x & x \ge 1 \end{cases}$$

$$\lim_{x \to -1^-} x + 1$$

$$\lim_{x \to -1^-} (-1) + 1 = 0$$

$$\lim_{x \to -1^+} x^2$$

$$\lim_{x \to -1^+} = (-1)^2 = 1$$

$$\lim_{x \to -1} f(x) = \text{No existe}$$

4.- $\lim\limits_{x \to 1^+} f(x)$ y $\lim\limits_{x \to 1^-} f(x)$, donde $f(x)$ es la misma funcion del inciso 3.

$$\lim_{x \to 1^-} x^2$$

$$\lim_{x \to 1^-} (1)^2 = 1$$

$$\lim_{x \to 1^+} 2 - x$$

$$\lim_{x \to 1^+} 2 - x = 2 - (1) = 1$$

$$\lim_{x \to 1} f(x) = 1$$

Calcule, si existen, los siguientes límites

5.- $\lim\limits_{x \to -2} \dfrac{x+2}{x^2+8}$

$\lim\limits_{x \to -2} \dfrac{x+2}{x^2+8} = \dfrac{(-2)+2}{(-2)^2+8}$

$\lim\limits_{x \to -2} \dfrac{x+2}{x^2+8} = \dfrac{0}{12} = 0$

$\lim\limits_{x \to -2} \dfrac{x+2}{x^2+8} = 0$

6.- $\lim\limits_{x \to -6} \dfrac{2x+12}{|x+6|}$

$\lim\limits_{x \to -6} \dfrac{2x+12}{|x+6|} = \dfrac{2(-6)+12}{|(-6)+6|}$

$\lim\limits_{x \to -6} \dfrac{2x+12}{|x+6|} = \dfrac{0}{|0|} = \text{indeterminado}$

$\lim\limits_{x \to -6^{+}} \dfrac{2x+12}{|x+6|} = \lim\limits_{x \to -6^{+}} \dfrac{2x+12}{x+6}$

$\lim\limits_{x \to -6^{+}} \dfrac{2x+12}{x+6} = \dfrac{2\,\cancel{(x+6)}}{\cancel{x+6}} = 2$

$\lim\limits_{x \to -6^{-}} \dfrac{2x+12}{-(x+6)} = \dfrac{2\,\cancel{(x+6)}}{-\cancel{(x+6)}} = -2$

$\lim\limits_{x \to -6} \dfrac{2x+12}{|x+6|} = \text{No existe}$

7.- $\lim\limits_{x \to \infty} \dfrac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}}$

$\lim\limits_{x \to \infty} \dfrac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = \dfrac{e^{3(\infty)} - e^{-3(\infty)}}{e^{3(\infty)} + e^{-3(\infty)}}$

$\lim\limits_{x \to \infty} \dfrac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = \dfrac{e^{\infty} - e^{-\infty}}{e^{\infty} + e^{-\infty}}$

$$\lim_{x \to \infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = \frac{\infty - \dfrac{1}{e^{\infty}}}{\infty + \dfrac{1}{e^{\infty}}}$$

$$\lim_{x \to \infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = \frac{\infty - \dfrac{1}{\infty}}{\infty + \dfrac{1}{\infty}}$$

$$\lim_{x \to \infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = \frac{\infty - 0}{\infty + 0} = 1$$

$$\boxed{\lim_{x \to \infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = 1}$$

8.- $\displaystyle\lim_{x \to -4} \frac{\dfrac{1}{4} + \dfrac{1}{x}}{|4 + x|}$

$$\lim_{x \to -4} \frac{\dfrac{1}{4} + \dfrac{1}{x}}{|4 + x|} = \lim_{x \to -4} \frac{\dfrac{1}{4} + \dfrac{1}{-4}}{|4 + (-4)|}$$

$$\lim_{x \to -4} \frac{\dfrac{1}{4} + \dfrac{1}{x}}{|4 + x|} = \lim_{x \to -4} \frac{\dfrac{1}{4} - \dfrac{1}{4}}{|0|} = \text{indeterminado}$$

$$\lim_{x \to -4^+} \frac{\dfrac{1}{4} + \dfrac{1}{x}}{4 + x} = \lim_{x \to -4^+} \frac{4x\left(\dfrac{1}{4} + \dfrac{1}{x}\right)}{4x(4 + x)}$$

$$\lim_{x \to -4^+} \frac{4x\left(\dfrac{1}{4} + \dfrac{1}{x}\right)}{4x(4 + x)} = \frac{\dfrac{4x}{4} + \dfrac{4x}{x}}{4x(4 + x)}$$

$$\lim_{x \to -4^+} \frac{4x\left(\dfrac{1}{4} + \dfrac{1}{x}\right)}{4x(4 + x)} = \frac{\cancel{x + 4}}{4x\,\cancel{(4 + x)}} = \frac{1}{4x}$$

$$\lim_{x \to -4^+} \frac{4x\left(\dfrac{1}{4} + \dfrac{1}{x}\right)}{4x(4 + x)} = \frac{1}{4(-4)} = -\frac{1}{16}$$

$$\lim_{x \to -4^-} \frac{\frac{1}{4} + \frac{1}{x}}{-(4 + x)} = \lim_{x \to -4^+} \frac{4x(\frac{1}{4} + \frac{1}{x})}{4x(-4 - x)}$$

$$\lim_{x \to -4^-} \frac{4x(\frac{1}{4} + \frac{1}{x})}{4x(-4 - x)} = \frac{\frac{4x}{4} + \frac{4x}{x}}{4x(-4 - x)}$$

$$\lim_{x \to -4^+} \frac{4x(\frac{1}{4} + \frac{1}{x})}{4x(-4 - x)} = \frac{\cancel{x + 4}}{4x\ \cancel{(-4 - x)}} = \frac{1}{4x}$$

$$\lim_{x \to -4^+} \frac{4x(\frac{1}{4} + \frac{1}{x})}{4x(-4 - x)} = \frac{-1}{4(-4)} = \frac{1}{16}$$

$$\lim_{x \to -4} \frac{\frac{1}{4} + \frac{1}{x}}{|4 + x|} = \text{No existe}$$