ICE– Institutos de Ciências Exatas

DEMAT – Departamento de Matemática

CÁLCULO 1 – SEMANA 8 – TEOREMAS E REGRAS DE L'HOPITAL

Componente Curricular:
IC241 - CÁLCULO I (90h) - Turma: 02 (2020.1)
IC241 - CÁLCULO I (90h) - Turma: 07 (2020.1)
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COMPREENSÃO DAS REGRAS DE L'HOPITAL OBSERVANDO O GRÁFICO DAS FUNÇÕES

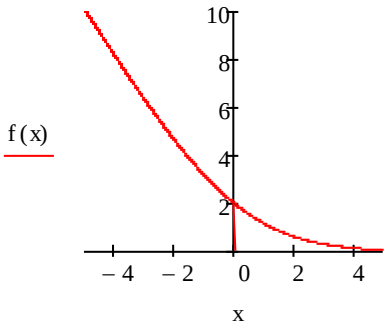
(Veja os limites observando os gráficos)

Regras de L´Hopital

1) Indeterminações do tipo [0/0]

$$f(x) := \frac{2 \cdot x}{e^{x} - 1} \qquad \lim_{x \to 0} f(x) = \frac{0}{0}$$

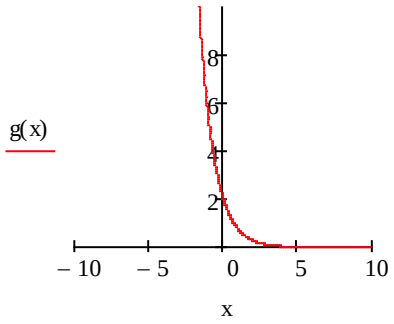
$$\lim_{x \to 0} f(x) \to 2$$



Derivando o numerador e o denominador:

$$g(x) := \frac{2}{e^{x}}$$

$$\lim_{x \to 0} \frac{\left[\frac{d}{dx}(2 \cdot x)\right]}{\left[\frac{d}{dx}\left(e^{x} - 1\right)\right]} \to 2$$



Observe ambas as tendem a 2, 0.

pelos gráficos que funções f(x) e g(x) quando x tende a

2) Indeterminação do tipo $\frac{0}{0}$

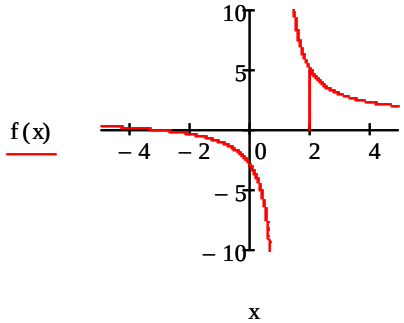
Aplicando L'Hopital

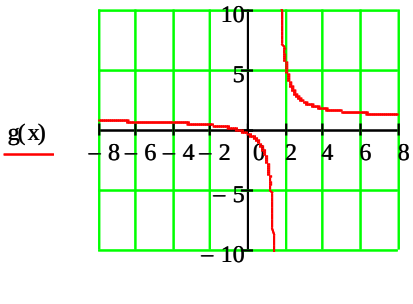
$$f(x) := \frac{x^2 + x - 6}{x^2 - 3x + 2}$$

$$g(x) := \frac{2x + 1}{2x - 3}$$

$$\lim_{x \to 2} f(x) \to 5$$

$$\lim_{x \to 2} \frac{\left[\frac{d}{dx}\left(x^2 + x - 6\right)\right]}{\left[\frac{d}{dx}\left(x^2 - 3x + 2\right)\right]} \to 5$$





Observe pelos gráficos que ambas as funções f(x) e g(x) tendem a 5, quando x tende a 2.

3) Indeterminação do tipo $\frac{0}{0}$

$$f(x) := \frac{\sin(x) - x}{e^{x} + e^{-x} - 2}$$

$$\lim_{x \to 0} f(x) \to 0$$

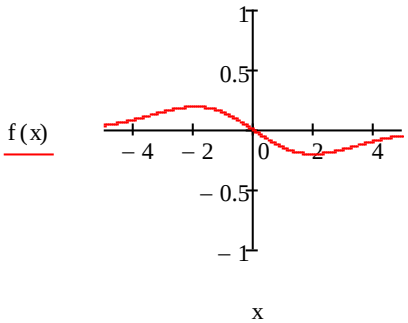
$$g(x) := \frac{\cos(x) - 1}{e^{x} - e^{-x}}$$

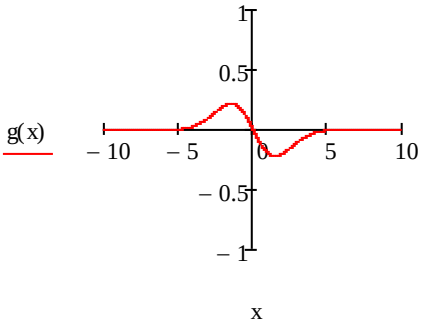
$$\lim_{x \to 0} g(x) \to 0$$

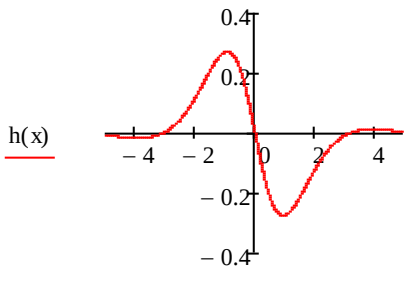
$$h(x) := \frac{-\sin(x)}{e^{x} + e^{-x}}$$

$$\lim_{x \to 0} h(x) \to 0$$

Observe pelos gráficos que todas as funções f(x), g(x) e h(x) tendem a 0, quando x tente a 0







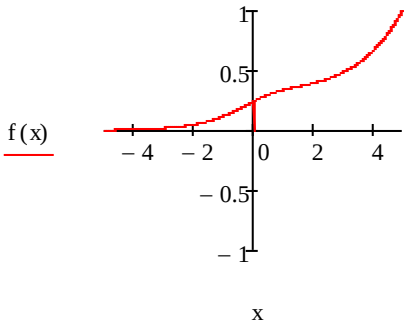
4) Indeterminaçao do tipo $\frac{\infty}{\infty}$

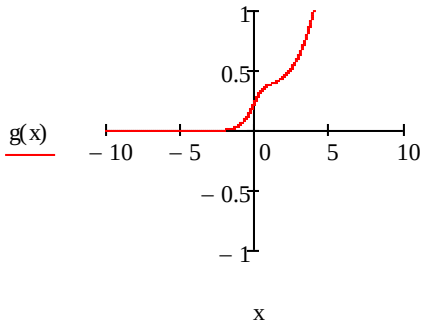
$$f(x) := \frac{e^x - 1}{x^3 + 4x}$$

$$g(x) := \frac{e^x}{3 \cdot x^2 + 4}$$

$$\lim_{x \to \infty} f(x) \to \infty$$

$$\lim_{x \to \infty} g(x) \to \infty$$





$$h(x) := \frac{e^x}{3 \cdot x^2 + 4}$$

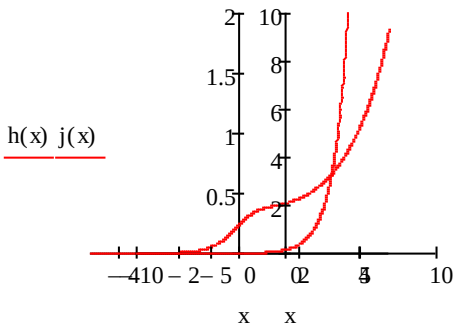
$$j(x) := \frac{e^x}{6}$$

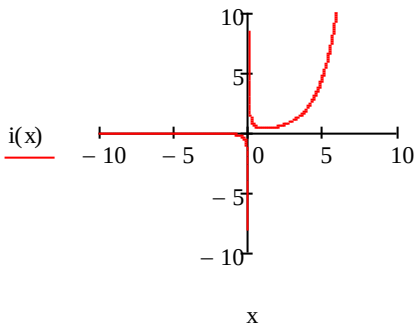
$$i(x) := \frac{e^x}{6 \cdot x} =$$

$$\lim_{x \to \infty} j(x) \to \infty$$

$$\lim_{x \to \infty} h(x) \to \infty$$

$$\lim_{x \to \infty} i(x) \to \infty$$





Observe pelos gráficos que todas as funções f(x), g(x) e h(x), i(x) e j(x) tendem a infinito, quando x tende a infinito.