Solução da 2ª Chamada

1. (a) $\lim_{x\to 3^-}\frac{x^2-4x+4}{x^2-5x+6} = \text{``}\frac{1\checkmark}{0^-\checkmark}\text{''} = -\infty\checkmark$ (0.4)

   (b) $\lim_{x\to 3^-}\frac{x^2-4x+3}{x^2-5x+6} = \text{``}\frac{0}{0}\text{''}\checkmark = \lim_{x\to 3^-}\frac{(x-3)(x-1)}{(x-3)(x-2)}\checkmark = \lim_{x\to 3^-}\frac{x-1}{x-2}\checkmark = \frac{2}{1}\checkmark = 2\checkmark$ (0.5)

   (c) $\lim_{x\to 0}\frac{e^x-1-x}{x^2} = \text{``}\frac{0}{0}\text{''}\checkmark \overset{\text{L'H}}{=} \checkmark\lim_{x\to 0}\frac{e^x-1\checkmark}{2x\checkmark} = \text{``}\frac{0}{0}\text{''} \overset{\text{L'H}}{=} \lim_{x\to 0}\frac{e^x}{2}\checkmark = \frac{1}{2}\checkmark$ (0.6) (1.5)

2. (a) $f(x) = 2x^8 - 5x^3 + 6x + 7$, $f'(x) = 16x^7\checkmark - 15x^2\checkmark + 6\checkmark + 0\checkmark$ (0.4)

   (b) $g(y) = \cos(e^{20y})$, $g'(y) = -\operatorname{sen}(e^{20y}\checkmark)\checkmark \cdot e^{20y}\checkmark \cdot 20\checkmark$ (0.4)

   (c) $h(t) = \frac{\operatorname{senh} t}{1+\cosh t}$, $h'(t) = \frac{\cosh t\checkmark(1+\cosh t)\checkmark - \operatorname{senh} t\checkmark \operatorname{senh} t\checkmark}{(1+\cosh t)^2\checkmark} =$
   $\frac{\cosh t + \cosh^2 t - \operatorname{senh}^2 t}{(1+\cosh t)^2} = \frac{\cosh t + 1}{(1+\cosh t)^2} = \frac{1}{1+\cosh t}\checkmark$ (0.6)

   (d) $k(z) = \operatorname{arcsen} z \cdot \ln(8y)\cdot 2^z$, $k'(z) = \frac{1}{\sqrt{1-z^2}}\checkmark \cdot \ln(8y)\cdot 2^z\checkmark$
   $+ \operatorname{arcsen} z \cdot \frac{1}{8z\checkmark}8\checkmark \cdot 2^z + \operatorname{arcsen} z\cdot\ln(8y)\cdot 2^z\checkmark \ln 2\checkmark$ (0.6) (2.0)

3. (a) $I_a = \int x^3\sqrt{x^2+1}\,dx$: $u = x^2+1\checkmark$, $du = 2x\,dx\checkmark$, $x\,dx = du/2$, $x^2 = u-1\checkmark$
   $I_a = \frac{1}{2}\int (u-1)\sqrt{u}\,du\checkmark = \frac{1}{2}\int u^{3/2}\,du - \frac{1}{2}\int u^{1/2}\,du\checkmark = \frac{1}{2}\frac{u^{5/2}}{5/2} - \frac{1}{2}\frac{u^{3/2}}{3/2}\checkmark + C\checkmark =$
   $\frac{1}{5}(x^2+1)^{5/2} - \frac{1}{3}(x^2+1)^{3/2} + C\checkmark = \frac{1}{15}\sqrt{x^2+1}(3x^4+x^2-2)+C\checkmark$ (0.9)

   (b) $I_a = \frac{1}{x^2-2x-8}\,dx = \int\frac{1}{(x+2)(x-4)\checkmark}\,dx.$
   Frações parciais: $\frac{1}{(x+2)(x-4)} = \frac{A}{x+2} + \frac{B}{x-4}\checkmark = \frac{A(x-4)+B(x+2)}{(x-4)(x+2)} =$
   $\frac{(A+B)x-4A+2B}{(x-4)(x+2)}$. Assim, $A+B=0 \Rightarrow B=-A\checkmark$ e $-4A+2B=1\checkmark \Rightarrow$
   $-4A-2A=1 \Rightarrow A=-1/6 \Rightarrow B=1/6\checkmark$.
   $I_b = -\frac{1}{6}\int\frac{1}{x+2}\,dx + \frac{1}{6}\int\frac{1}{x-4}\,dx\checkmark = -\frac{1}{6}\ln|x+2| + \frac{1}{6}\ln|x-4|\checkmark + C\checkmark =$
   $\frac{1}{6}\ln C\left|\frac{x-4}{x+2}\right|$ (0.8)

   (c) $I_c = \frac{1}{x^2+6x+10}\,dx = \int\frac{1}{(x+3)^2+1}\checkmark\,dx$: $u = x+3\checkmark$, $du = dx\checkmark$
   $I_c = \int\frac{1}{u^2+1}\checkmark\,du = \arctan u\checkmark + C\checkmark = \arctan(x+3)+C\checkmark$ (0.7) (2.4)

4. Numerador: $I_N = \int_0^1\checkmark x\operatorname{sen}\pi x\checkmark dx$. Intergração por partes: $f(x)=x$, $f'(x)=1\checkmark$,
   $g'(x) = \operatorname{sen}\pi x$, $g(x) = -\frac{1}{\pi}\cos\pi x\checkmark$. Assim, $I_N = -\frac{x}{\pi}\cos\pi x\Big|_0^1 + \frac{1}{\pi}\int_0^1\cos\pi x\,dx\checkmark =$

$$-\frac{1}{\pi}(1\cdot(-1)-0\cdot 1)+\frac{1}{\pi^2}\,\text{sen}\,\pi x\Big|_0^1 \checkmark = \frac{1}{\pi}+\frac{1}{\pi^2}(0-0)=\frac{1}{\pi}\checkmark \qquad (0.6)$$

Denominador: $I_D = \int_0^1 \text{sen}\,\pi x\,dx\checkmark = -\frac{1}{\pi}\cos\pi x\Big|_0^1 \checkmark = -\frac{1}{\pi}(-1-1)\checkmark = \frac{2}{\pi}\checkmark$ (0.5)

Portanto, $C_M = \frac{1/\pi}{2/\pi} = \frac{1}{2}\checkmark$ (0.1)

(1.2)

5. (a) Domínio: $y(0)\nexists \Rightarrow \mathbb{D} = \mathbb{R} - 0\checkmark$ (0.1)

(b) $0 \notin \mathbb{D} \Rightarrow$ não tem intercepto y.

$y(x) = x+5+\frac{4}{x} = \frac{(x+4)(x+1)}{x} = 0$ em $x=-1\checkmark$ e $x=-4\checkmark$ (0.2)

(c) Pontos críticos: $y'(x) = 1-\frac{4}{x^2}\checkmark = \frac{x^2-4}{x^2} = \frac{(x+2)(x-2)}{x^2} = 0\checkmark$ em $x=\pm 2\checkmark$

$y'(x)\nexists$ em $x=0$, mas este ponto não faz parte do domínio da função.$\checkmark$

$y''(x) = \frac{8}{x^3}\checkmark \Rightarrow y''(-2) = \frac{8}{-8} = -1\checkmark < 0 \Rightarrow$ máximo relativo$\checkmark$.

$y''(x) = \frac{8}{x^3} \Rightarrow y''(2) = \frac{8}{8} = 1\checkmark > 0 \Rightarrow$ mínimo relativo$\checkmark$. (0.9)

(d) $y''(x) \neq 0\checkmark\ \forall\, x\in\mathbb{D} \Rightarrow$ não há pontos de inflexão$\checkmark$. (0.2)

(e) Assíntotas verticais:

$\lim_{x\to 0^+} x+5+\frac{4}{x}\checkmark = 5+\frac{4}{0^+} = +\infty\checkmark$ e $\lim_{x\to 0^-} x+5+\frac{4}{x}\checkmark = 5+\frac{4}{0^-} = -\infty\checkmark$

Portanto, a reta $x=0$ é assíntota vertical$\checkmark$.

Assíntotas horizontais: $\lim_{x\to\infty} x+5+\frac{4}{x} = \infty$ e $\lim_{x\to-\infty} x+5+\frac{4}{x} = -\infty$

Portanto, a função não há assíntotas horizontais.

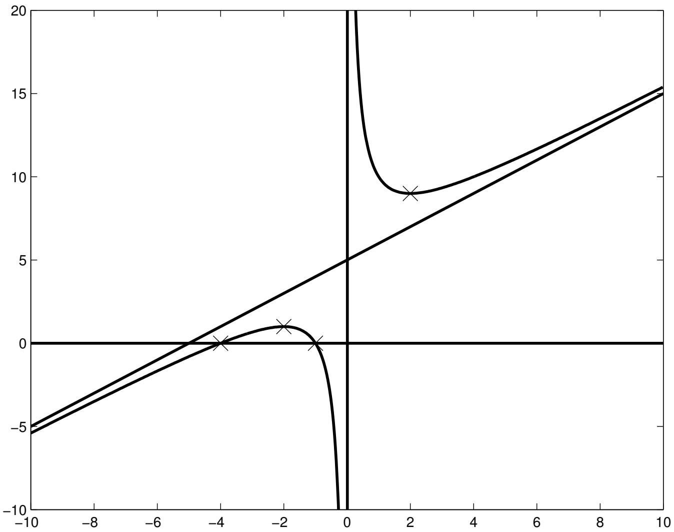
Assíntotas inclinadas: $\lim_{x\to\pm\infty} 1-\frac{4}{x^2}\checkmark = 1\checkmark = m$

$\lim_{x\to\pm\infty} x+5+\frac{4}{x}-mx\checkmark = \lim_{x\to\pm\infty} x+5+\frac{4}{x}-x = \lim_{x\to\pm\infty} 5+\frac{4}{x} = 5\checkmark = b$

Portanto, a reta $y=x+5$ é assíntota inclinada para $x\to\pm\infty\checkmark$. (1.0)

(f) Imagem: $\mathbb{V} = \mathbb{R} - (1,9)\checkmark$ (0.1)

(g) Gráfico:



Zeros$\checkmark$
Extremos$\checkmark$
Comportamento no polo$\checkmark$
Comportamento assintótico$\checkmark$

(0.4)

(2.9)

(10.0)