(a) $g(x) = \int_2^x \frac{\cos^2(t-1)}{\sqrt{t^2+1}}dt$

$$f(t) = \frac{\cos^2(t-1)}{\sqrt{t^2+1}} \qquad \text{dom} f = \mathbb{R}$$

f é cont. $\mathbb{R}$

f é cont. em $[2, x]$ ou $[x, 2]$ $\forall x \in \mathbb{R}$

$\therefore \text{dom} g = \mathbb{R}$

(b) $g(x) = \int_5^x \frac{1}{t} dt$

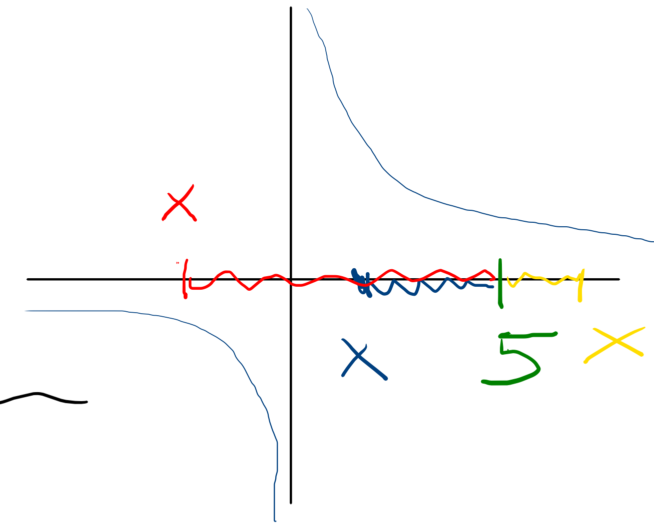
$f(t) = \frac{1}{t}$ dom $f = \mathbb{R} - \{0\}$

f cont. em $\mathbb{R} - \{0\}$

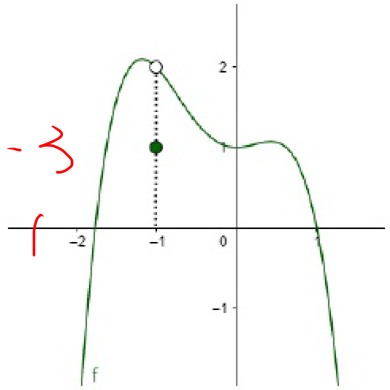
$\lim_{t \to 0^{+}_{-}} \frac{1}{t} = {}^{+}_{-}\infty$

f não é ltda

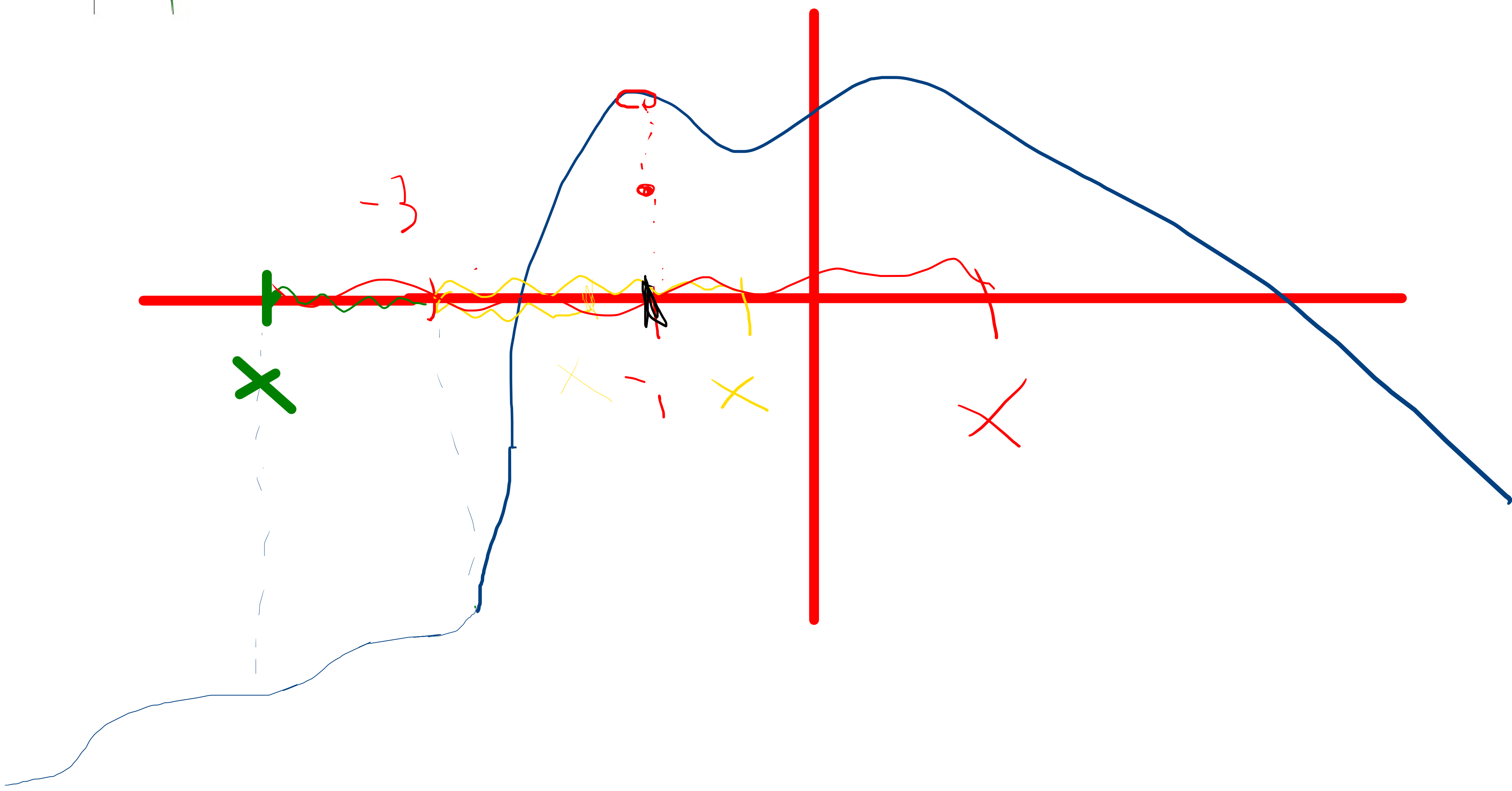
$\therefore$ dom g = $(0, +\infty)$



(c) $g(x) = \int_{-3}^{x} f(t)dt$ onde f é uma função contínua em $\mathbb{R} \setminus \{-1\}$ cujo gráfico é:



dom g = $\mathbb{R}$



(a) $y = x - 4$; $y = \frac{x}{4}$; $y = 0$ (Resposta: 8/3)

$$x = y + 4$$

$$y = x - 4$$

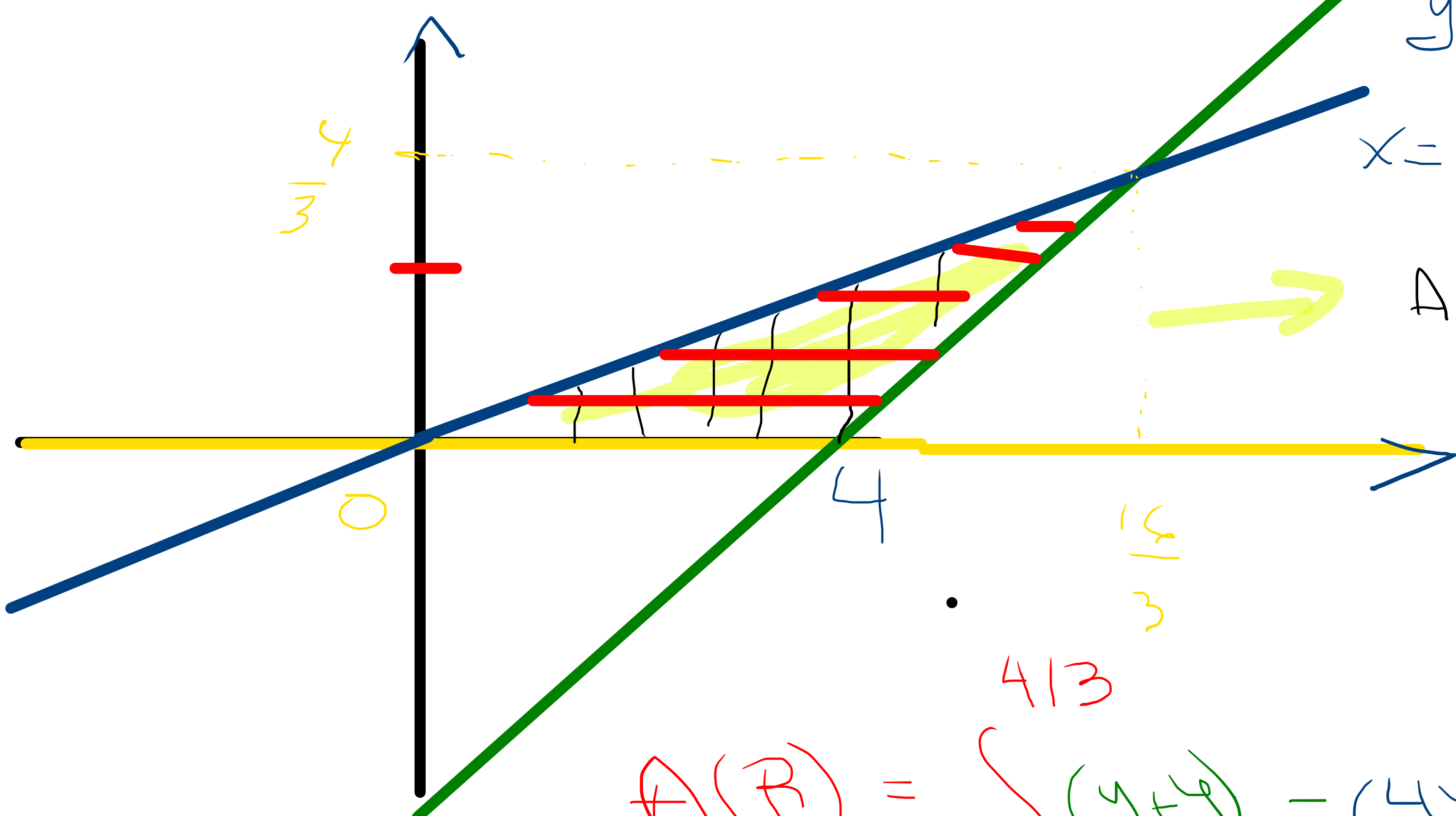
$$x - 4 = \frac{x}{4}$$

$$4x - 16 = x$$

$$x = \frac{16}{3}$$

$$y = \frac{x}{4}$$

$$x = 4y$$



$$A(R) = \int_0^4 \left(\frac{x}{4} - 0\right) dx + \int_4^{\frac{16}{3}} \left(\frac{x}{4} - (x-4)\right) dx$$

$$A(R) = \int_0^{4/3} (y+4) - (4y)\, dy$$

(b) $y = x + 5$; $y = 2$; $y = -1$; $x = y^2$ (Resposta: 33/2)

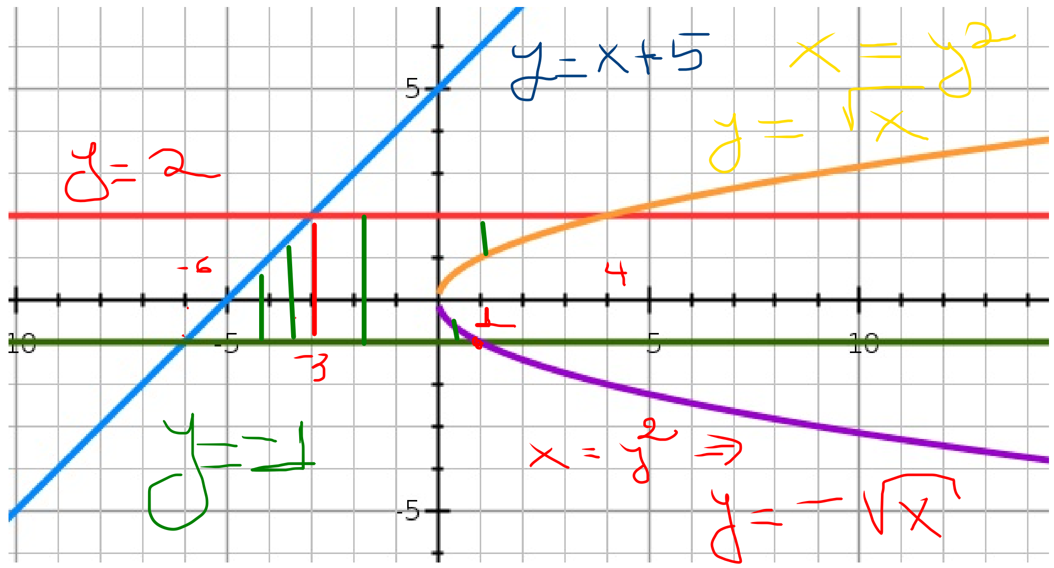
$x = y^2$

$\sqrt{x} = \sqrt{y^2}$

$\sqrt{x} = |y|$

$y = \sqrt{x}$

$y = -\sqrt{x}$



$y = x+5$ e $y = -1$

$x+5 = -1 \Rightarrow x = -6$

$y = 2$ e $x = y^2 \Rightarrow$

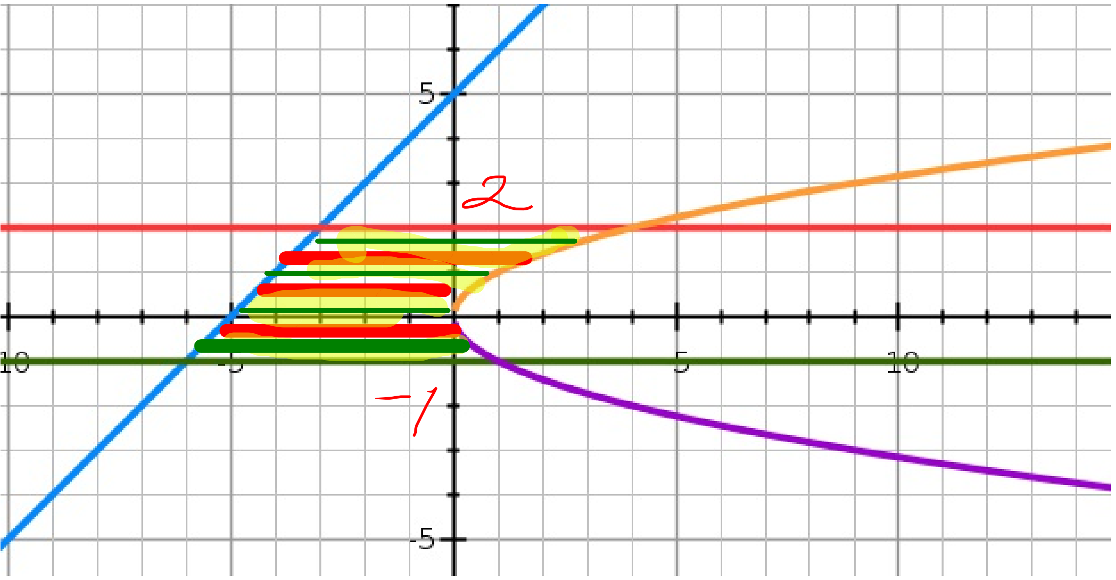
$\Rightarrow x = 4$

$y = x+5$ e $y = 2 \Rightarrow x = -3$

$y = -1$ e $x = y^2 \Rightarrow x = 1$

$$A(R) = \int_{-6}^{-3} (x+5) - (-1)\,dx + \int_{-3}^{0} 2 - (-1)\,dx + \int_{0}^{4} 2 - (\sqrt{x})\,dx$$

$$+ \int_{0}^{1} (-\sqrt{x} - (-1))\,dx$$



$$A(R) = \int_{-1}^{2} y^2 - (y-5) \, dy$$

$$y = x + 5 \Rightarrow \boxed{x = y - 5}$$

$$\boxed{x = y^2}$$

(a) $\int_0^1 x\sqrt{x^2+1}\,dx$

$$u = x^2 + 1 \longrightarrow \begin{cases} x = 0 \Rightarrow u = 1 \\ x = 1 \Rightarrow u = 2 \end{cases}$$

$$du = 2\underbrace{x\,dx} \Rightarrow \frac{du}{2}$$

$$\int_0^1 x\underbrace{\sqrt{x^2+1}}\,dx = \int_1^2 u^{1/2}\,\frac{1}{2}du = \frac{1}{\cancel{2}}\, u^{3/2}\cdot\frac{\cancel{2}}{3}\Big|_1^2 =$$

$$= \frac{1}{3}\sqrt{8} - \frac{1}{3}$$

(b) $\int_0^2 \frac{x^2}{x^6+1}dx$

$$\int \frac{x^2}{x^6+1}dx = \int \frac{x^2}{(x^3)^2+1}dx = \frac{1}{3}\int \frac{1}{u^2+1}du$$

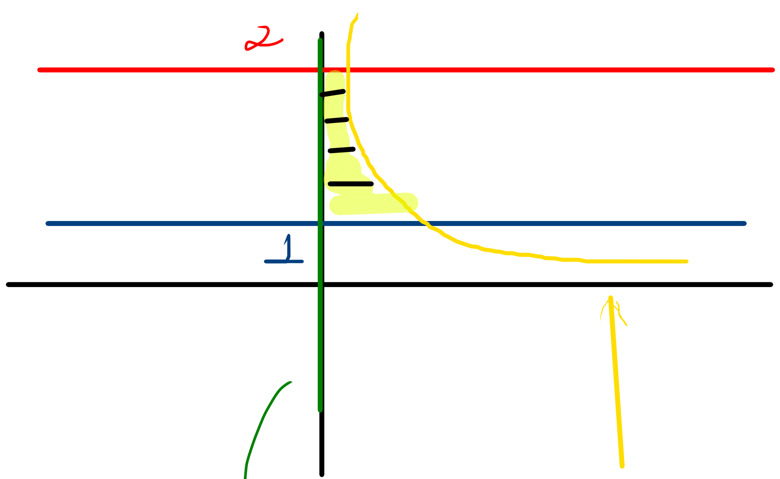
$$u = x^3$$
$$du = 3x^2 dx$$

$$= \frac{1}{3}\operatorname{arctg}(u) + C = \frac{1}{3}\operatorname{arctg}(x^3) + C$$

$$\int_0^2 \frac{x^2}{x^6+1}dx = \frac{1}{3}\operatorname{arctg}(x^3)\Big|_0^2 = \frac{1}{3}\operatorname{arctg}(8) - \frac{1}{3}\operatorname{arctg}(0)$$

Calcule a área da região limitada pelas curvas:

$$y = \frac{1}{x}; \quad x = 0; \quad y = 1; \quad y = 2 \ (\text{Resposta: } \ln 2)$$



$\boxed{x = 0}$

$y = \frac{1}{x}$

$\Updownarrow$

$\boxed{x = \frac{1}{y}}$

$$A(R) = \int_1^2 \left(\frac{1}{y} - 0 \right) dy =$$

$$= \int_1^2 \frac{1}{y}\, dy = \ln|y| \Big|_1^2 =$$

$$= \ln 2 - \ln 1 = \underline{\underline{\ln 2}} \ u^2$$