

1ra. parte

Exercício 1 (a) $Dom f = (1, +\infty)$ $Im f = \mathbb{R}$

Exercício 2

a) $\lim_{x \rightarrow +\infty} (2^x - 3^x) = -\infty$

b) $\lim_{x \rightarrow +\infty} \frac{1-2^x}{1-3^x} = 0$

c) $\lim_{x \rightarrow +\infty} (2^x + 2^{-x}) = \infty$

d) $\lim_{x \rightarrow +\infty} (\ln(2x+1) - \ln(x+3)) = \ln 2$

e) $\lim_{x \rightarrow 0} \frac{5^x - 1}{x} = \ln 5$

f) $\lim_{x \rightarrow +\infty} \left(1 + \frac{2}{x}\right)^x = e^2$

g) $\lim_{x \rightarrow +\infty} \left(\frac{x+2}{x+1}\right)^x = e$

h) $\lim_{x \rightarrow +\infty} (x \ln 2 - \ln(3^x + 1)) = -\infty$

i) $\lim_{x \rightarrow 0^+} \frac{3^x - 1}{x^2} = \infty$

j) $\lim_{x \rightarrow 0} \frac{e^\pi - 1}{x} = \nexists$

k) $\lim_{x \rightarrow 1^+} (\ln x)^{x-1} = 1$

l) $\lim_{x \rightarrow +\infty} \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} = 1$

m) $\lim_{x \rightarrow +\infty} (\ln(x+3))^{(x+4)} - \ln(x+2)^{(x+4)} = 1$

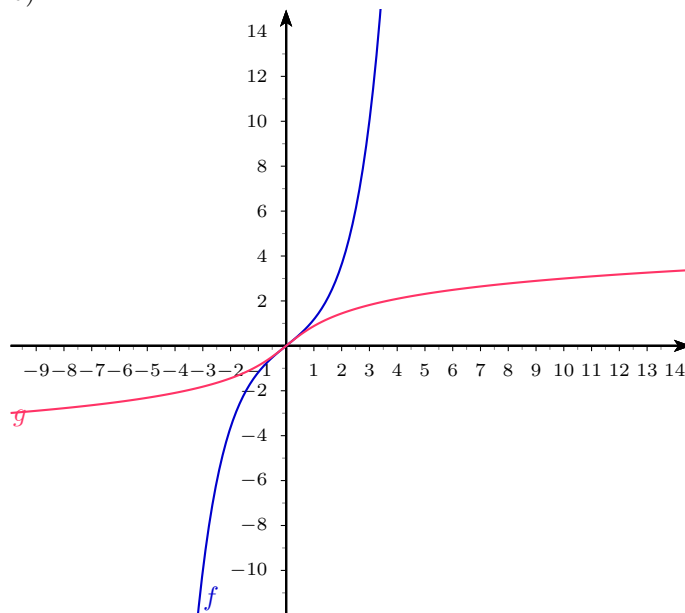
n) $\lim_{x \rightarrow 0} \frac{\ln(1+x^2)}{x \tan x} = 1$

o) $\lim_{x \rightarrow 0} (1 + \sin(2x))^{\left(\frac{1}{\sin x}\right)} = e^2$

Exercício 3

a) $g = \ln(x + \sqrt{x^2 + 1})$

b)



2da. parte

Exercício 1

a) $f(x) = \ln(\sin x + \tan x)$ Solution: $\frac{1}{\sin x + \tan x} (\cos x + \sec^2 x)$

- b) $f(x) = \cos x + (x^3 + e^x) \sin x$ Solution: $(\sin x)(e^x + 3x^2) - \sin x + (\cos x)(e^x + x^3)$
- c) $f(x) = \frac{x^2 \cos x - 7e^x}{3 \ln x + \sin x}$ Solution: $-\frac{1}{3 \ln x + \sin x} (7e^x + x^2 \sin x - 2x \cos x) - \frac{x^2 \cos x - 7e^x}{(3 \ln x + \sin x)^2} (\cos x + \frac{3}{x})$
- d) $f(x) = (x^2 + 1)^{\sin(x^{2011})}$ Solution: $2x (\sin x^{2011}) (x^2 + 1)^{\sin x^{2011} - 1} + 2011 x^{2010} (\ln(x^2 + 1) \cos x^{2011}) (x^2 + 1)^{\sin x^{2011}}$
- e) $f(x) = \sinh x$ Solution: $\cosh x$
- f) $f(x) = x^{\sin x}$ Solution: $x^{\sin x - 1} \sin x + x^{\sin x} \cos x \ln x$
- g) $f(x) = (\cos x^3)^4$ Solution: $-12x^2 \cos^3 x^3 \sin x^3$
- h) $f(x) = (x^2 + \cot x^2)^{\tan x^2}$ Solution: $(\tan x^2) (2x - 2x (\cot^2 x^2 + 1)) (\cot x^2 + x^2)^{\tan x^2 - 1} + 2x (\ln(\cot x^2 + x^2)) (\sec^2 x^2) (\cot x^2 + x^2)^{\tan x^2}$
- i) $f(x) = \sqrt{e^x + e^{-x}}$ Solution: $\frac{1}{2\sqrt{e^x + e^{-x}}} (e^x - e^{-x})$
- j) $f(x) = \frac{\cos(\sin x)}{\sin(\cos x)}$ Solution: $(\sin x \cos(\cos x)) \frac{\cos(\sin x)}{\sin^2(\cos x)} - \frac{\cos x}{\sin(\cos x)} \sin(\sin x)$
- k) $f(x) = e^{x^2 \cos x}$ Solution: $-e^{x^2 \cos x} (x^2 \sin x - 2x \cos x)$
- l) $f(x) = \frac{x + \sin x}{x - \sin x}$ Solution: $\frac{1}{x - \sin x} (\cos x + 1) + \frac{1}{(x - \sin x)^2} (\cos x - 1) (x + \sin x)$
- m) $f(x) = x^{x^x}$ Solution: $x^{x^x - 1} x^x + x^{x^x} (\ln x) (x^x \ln x + x x^{x-1})$
- n) $f(x) = (\cosh x)^x$ Solution: $\cosh^x x \ln(\cosh x) + x \cosh^{x-1} x \sinh x$
- o) $f(x) = \pi^{\arctan x} + x^\pi$ Solution: $\pi x^{\pi-1} + \pi^{\arctan x} \frac{\ln \pi}{x^2 + 1}$

Exercício 2: 10

Exercício 5: $c = -12$, $d = 12$

Exercício 7:

(a) $\frac{d^9}{dx^9} (x^8 \ln x) = \frac{40320}{x}$

(b) $\frac{d^4}{dx^4} (\cosh x) = \cosh x$

(c) $\frac{d^n}{dx^n} (\ln x) = \begin{cases} (n-1)!x^{-n}, & \text{se } n \text{ é ímpar} \\ -(n-1)!x^{-n}, & \text{se } n \text{ é par} \end{cases}$

(d) $\frac{d^4}{dx^4} (\cosh(2x)) = \begin{cases} 2^4 \sinh(2x), & \text{se } n \text{ é ímpar} \\ 2^4 \cosh(2x), & \text{se } n \text{ é par} \end{cases}$

Exercício 8: $y = \ln(x^2 + y^2)$ Solution: $y' = \frac{2x}{x^2 + y^2 - 2y}$

Exercício 9: $y^x = x^y$ Solution: $y' = \frac{x^{y-1} y - (y)^x \ln(y)}{x(y)^{x-1} - x^y (\ln x)}$

Exercício 13: $y = x + 2$

Exercício 18: (a) $a = 16$ (b) $a = 54$

Exercício 22: (1, 2)

Exercício 25: $c > 5$

Exercício 26: $x = \frac{1}{2}$

Exercício 27: $\frac{-2}{\ln 4}$

Exercício 28:

a) $\lim_{x \rightarrow 0} \left(\frac{\arctan 2x^2}{\ln(1+3x^2)} \right) = \frac{2}{3}$

b) $\lim_{x \rightarrow 0} (1 + \sin 2x)^{\frac{1}{\sin x}} = e^2$

c) $\lim_{x \rightarrow 0} \left(\frac{1}{1 - \cos x} - \frac{2}{x^2} \right) = \frac{1}{6}$

d) $\lim_{x \rightarrow 1^-} \frac{e^{\frac{1}{x^2-1}}}{x-1} = 0$

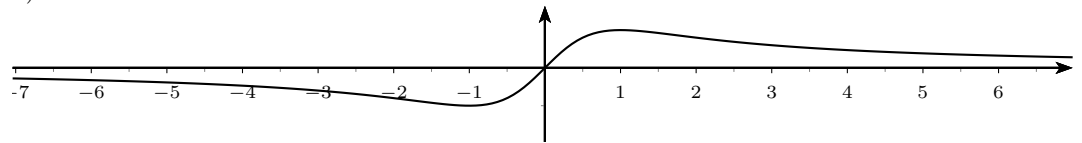
e) $\lim_{x \rightarrow +\infty} \frac{e^{2x}}{x^3} = \infty$

f) $\lim_{x \rightarrow 0^+} (\sin x \ln x) = 0$

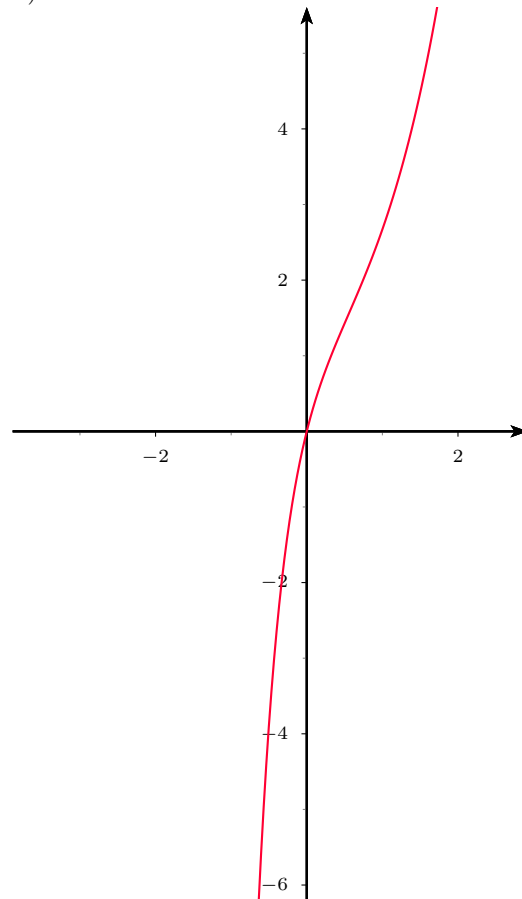
- g) $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} + \ln x \right) = \infty$
 h) $\lim_{x \rightarrow 0} \frac{x \sin(x) + 2x^2}{e^x + e^{-x} - 2} = 3$
 i) $\lim_{x \rightarrow \frac{\pi}{2}^+} (\tan x \sec x - \sec^2 x) = -\frac{1}{2}$
 j) $\lim_{x \rightarrow +\infty} \frac{\ln x}{e^{2x}} = 0$
 k) $\lim_{x \rightarrow 0^+} \frac{\ln x}{\cot x} = 0$
 l) $\lim_{x \rightarrow 0^+} (x^p \ln x) = 0, p > 0$

Exercício 29

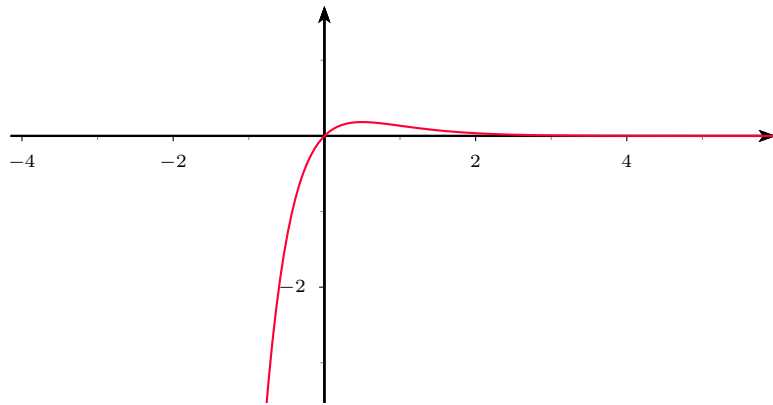
a)



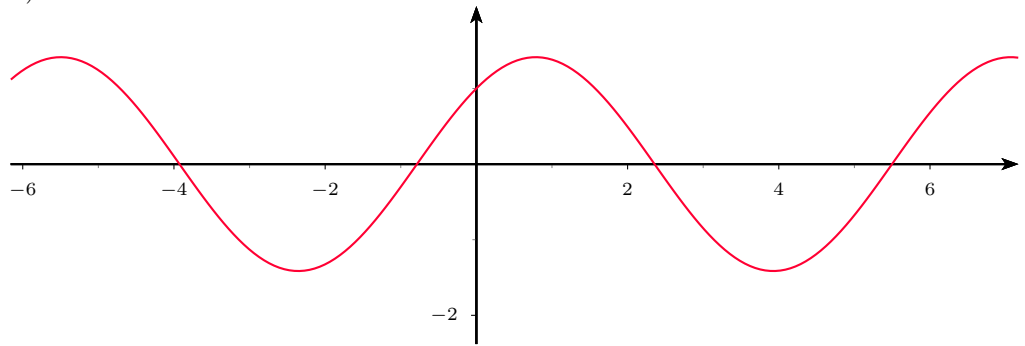
b)



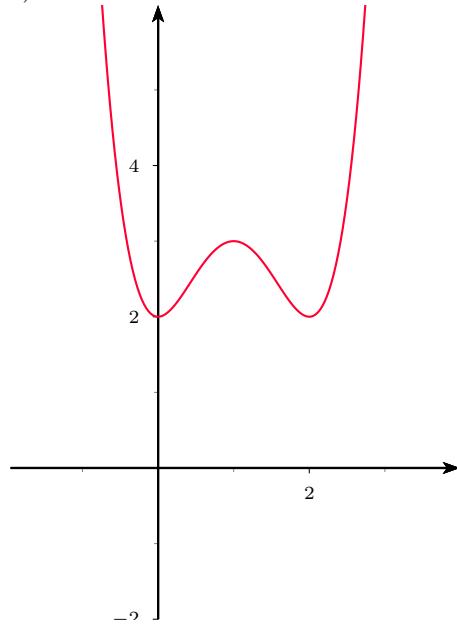
c)



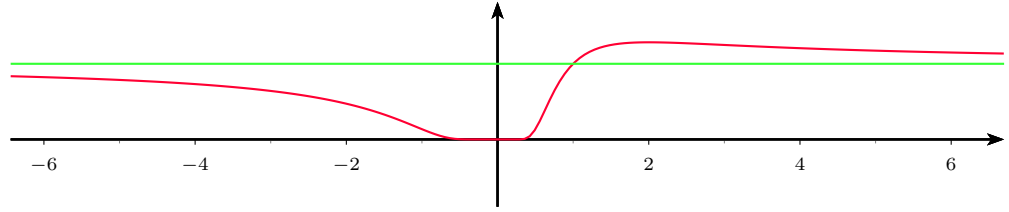
d)



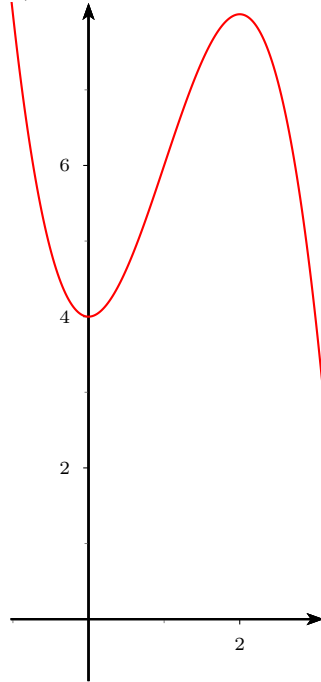
e)



f)

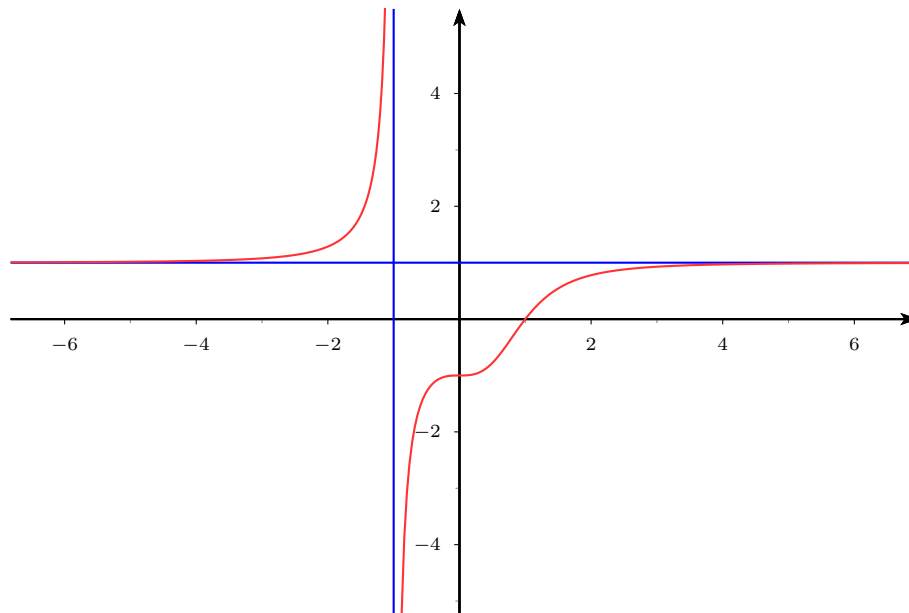


g)

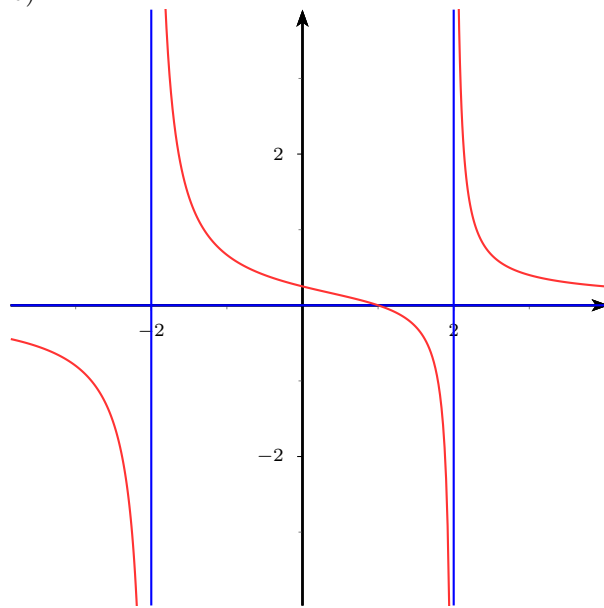


Exercício 30

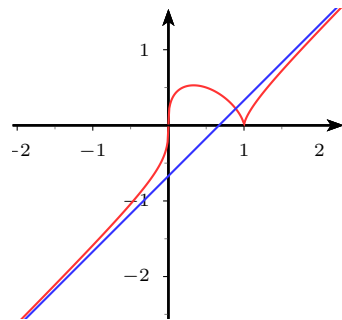
a)



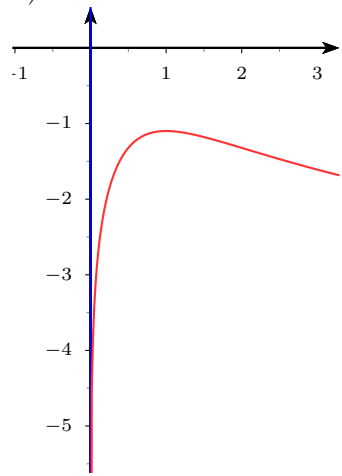
b)



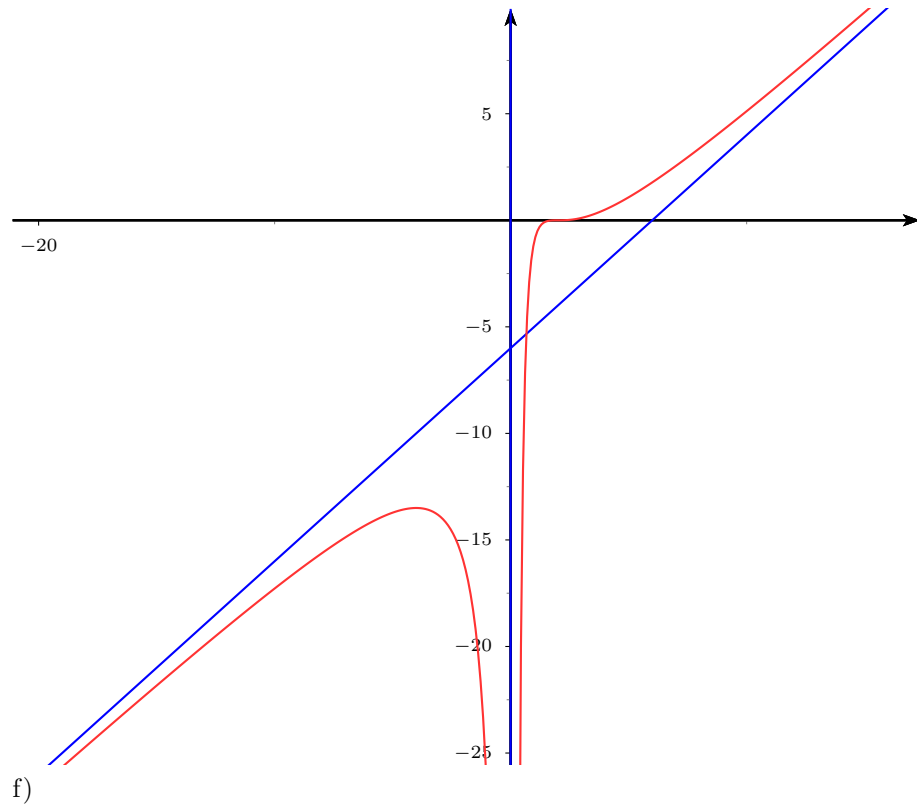
c) assíntota oblíqua $x - \frac{2}{3}$

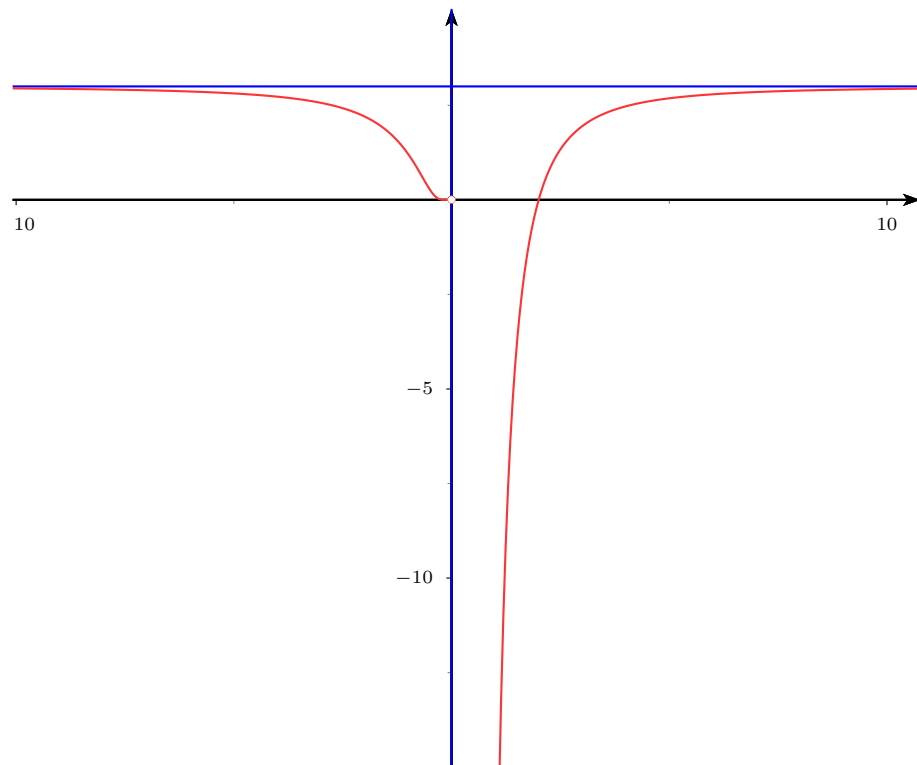


d)

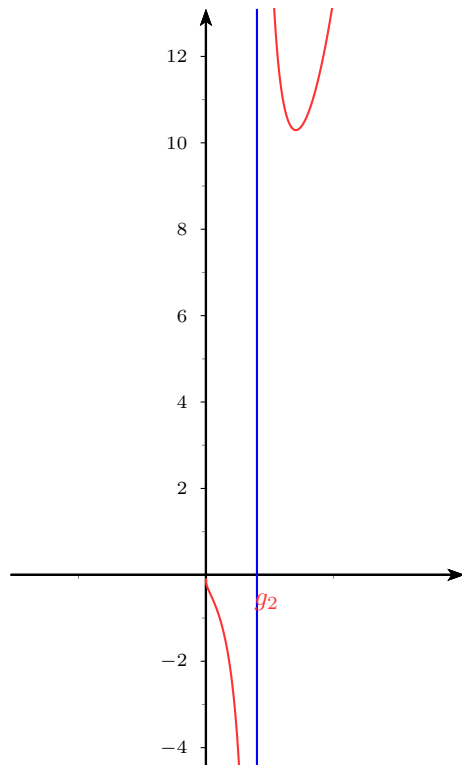


e) assíntota oblíqua $x - 6$

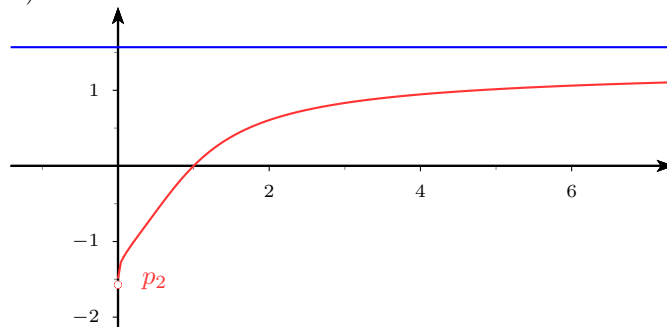




g)

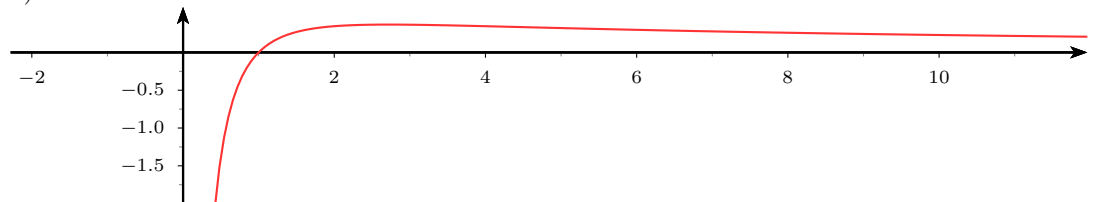


h)

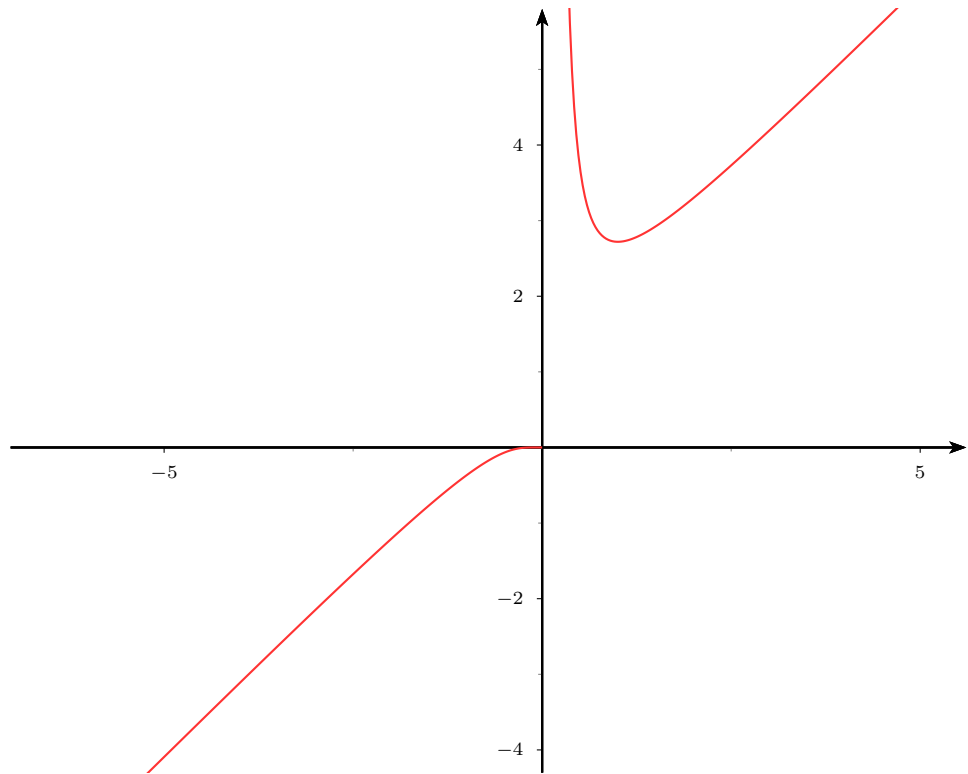


Exercício 31

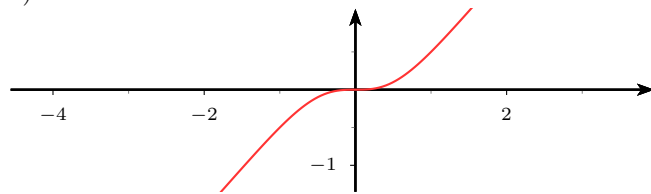
a)



b)

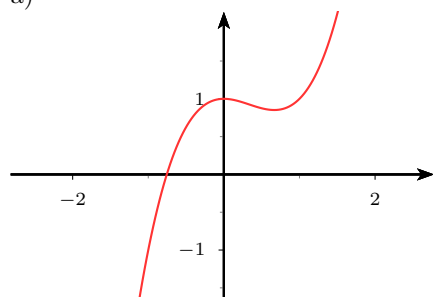


c)

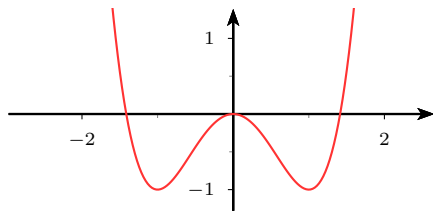


Exercício 32

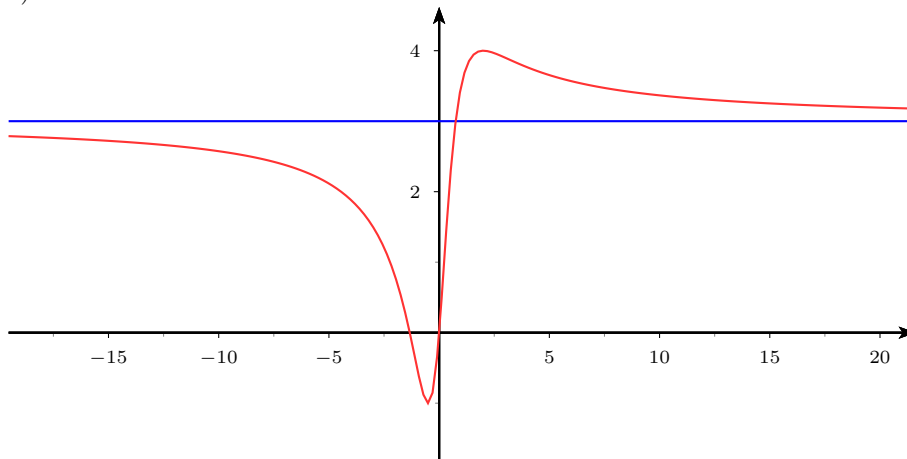
a)



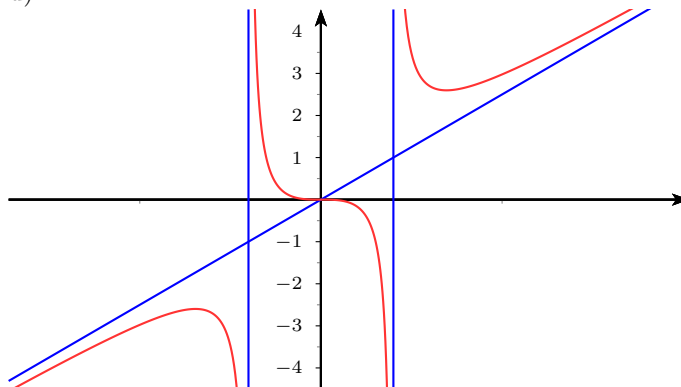
b)



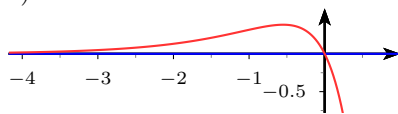
c)



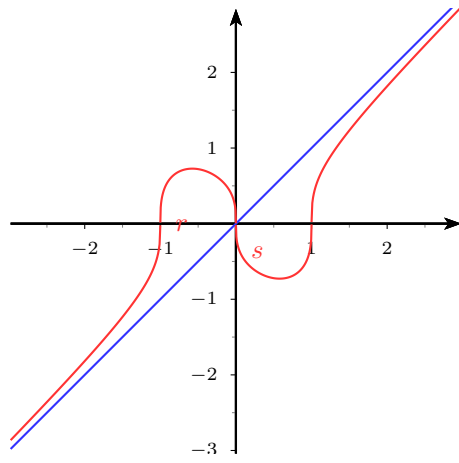
d)



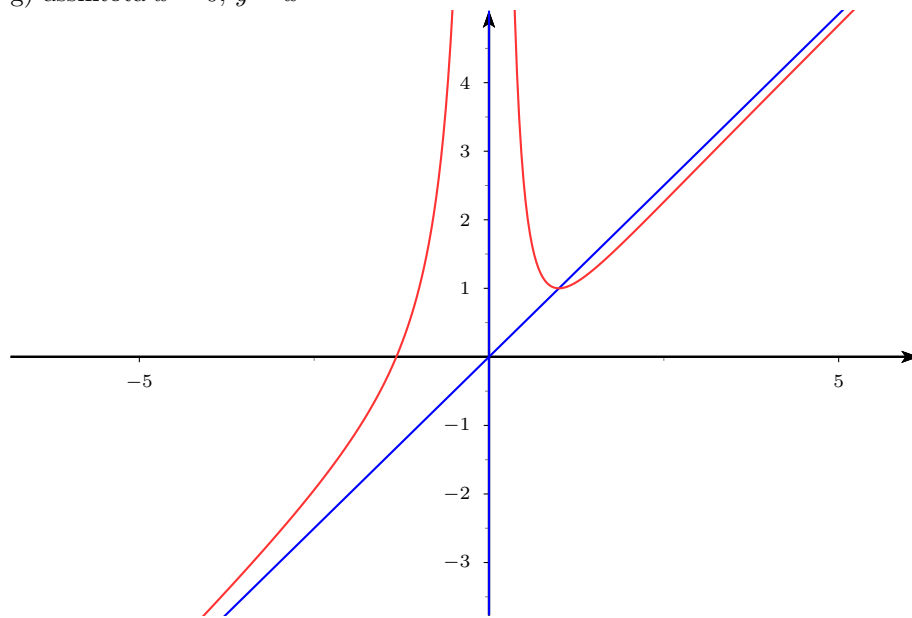
e)



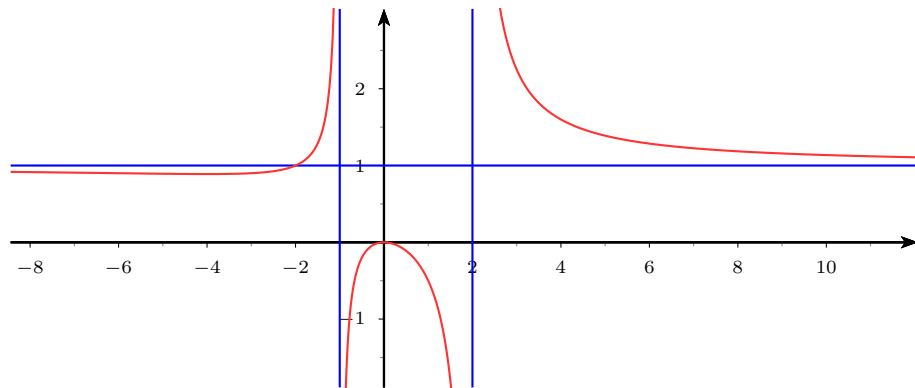
f) assíntota $y = x$



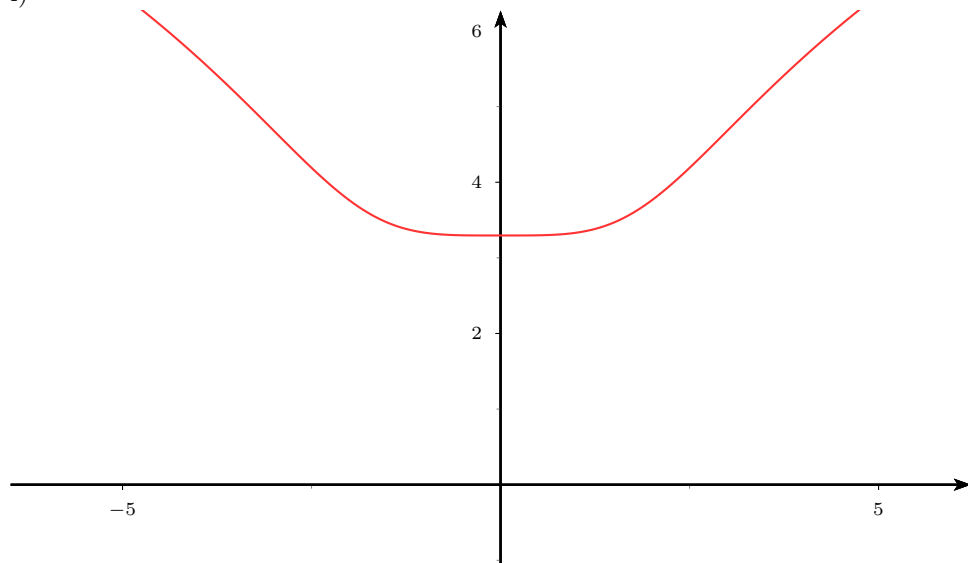
g) assíntota $x = 0$, $y = x$



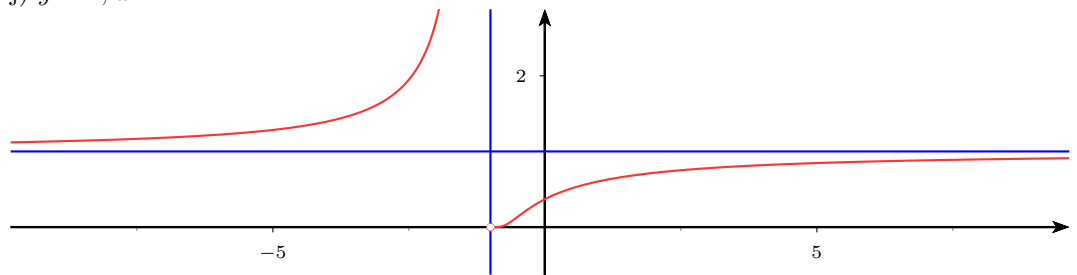
h) assíntotas $y = 1$, $x = -1$, $x = 2$



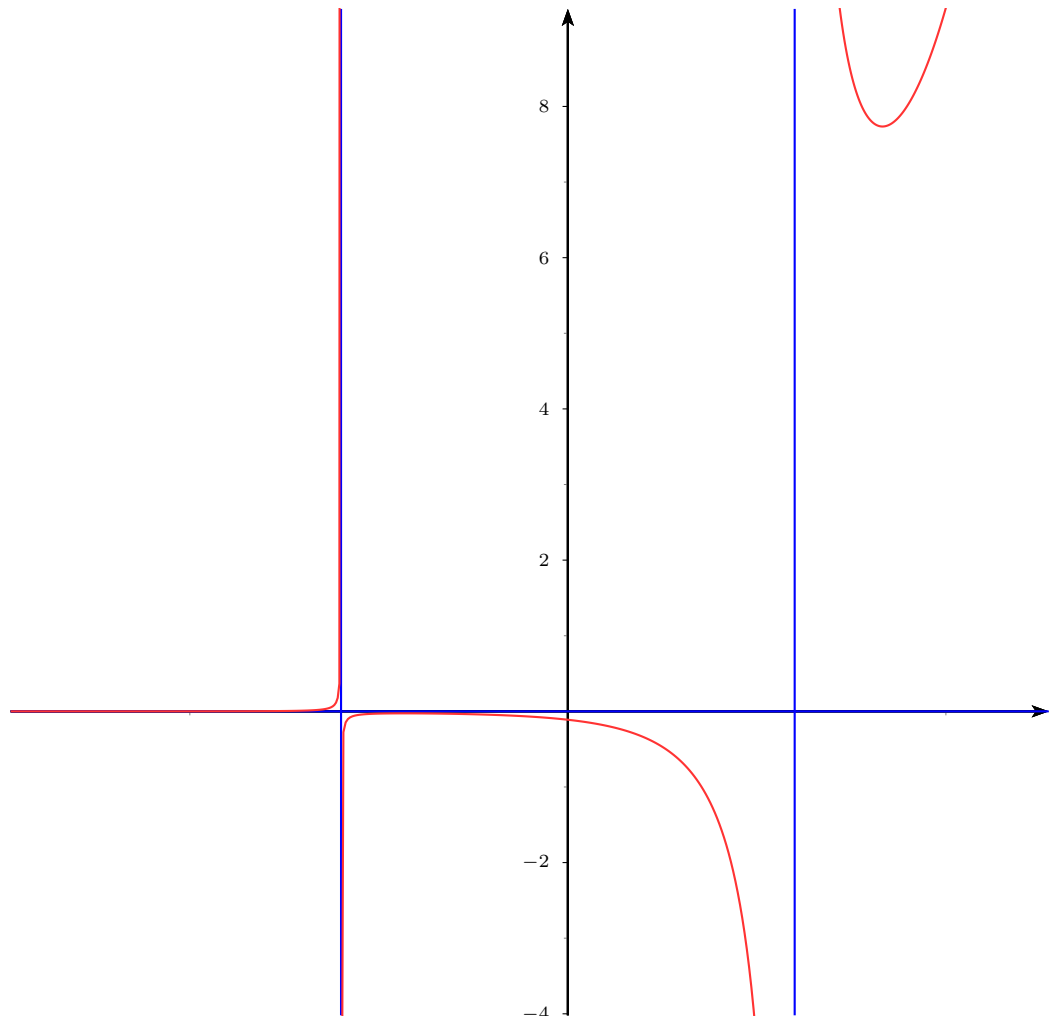
i)



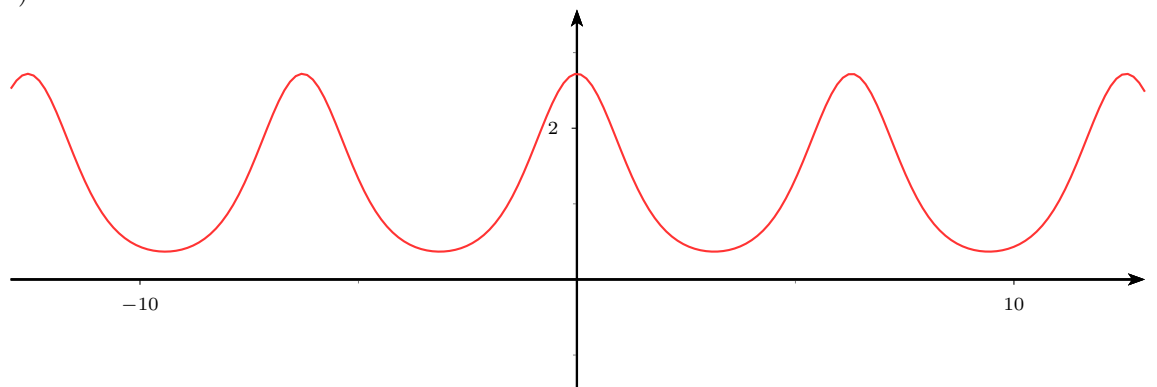
j) $y = 1, x = -1$



k)



l)



Exercício 33

