

" Função Exponencial "

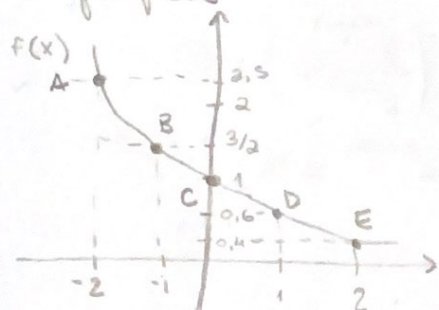
①

$$f(x) = \left(\frac{2}{3}\right)^x \rightarrow 0 < a < 1 \text{ decrescente}$$

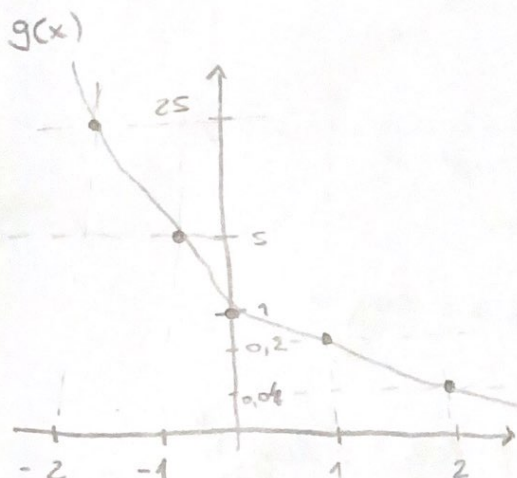
$$g(x) = \left(\frac{1}{5}\right)^x \rightarrow 0 < a < 1$$

f(x)		g(x)	
x	y	x	y
A -2	9/4	-2	25
B -1	3/2	-1	5
C 0	1	0	1
D 1	2/3	1	1/5
E 2	4/9	2	1/25

a) gráficos



$$b) \left(\frac{2}{3}\right)^{1/5} = \sqrt[5]{\frac{2}{3}}$$



$$\left(\frac{1}{5}\right)^{2/3} = \sqrt[3]{\left(\frac{1}{5}\right)^2} = \sqrt[3]{\frac{1}{25}}$$

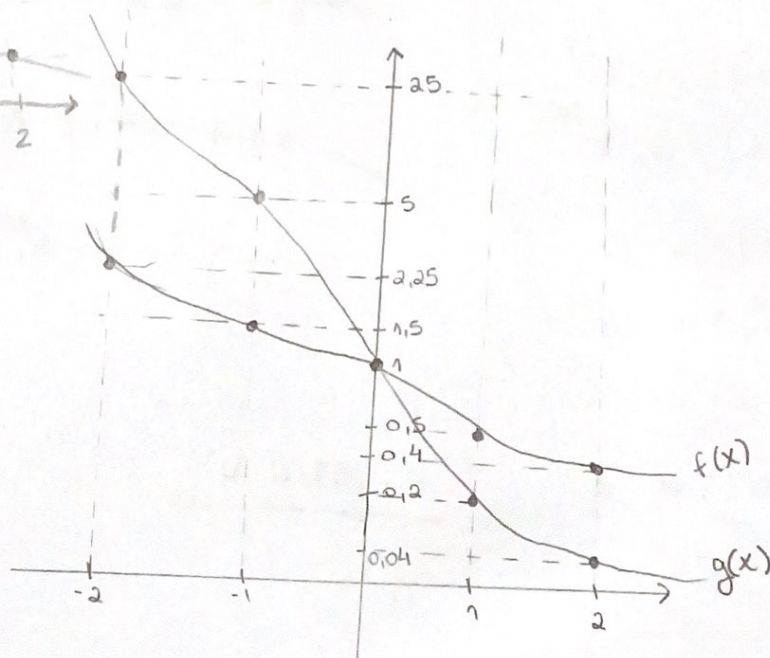
$$= \frac{\sqrt[3]{1}}{\sqrt[3]{25}} = \frac{1}{\sqrt[3]{25}} \cdot \frac{\sqrt[3]{5^2}}{\sqrt[3]{5^2}} = \frac{\sqrt[3]{5^2}}{5\sqrt[3]{5}}$$

$$\frac{9}{4} = 2,25 \quad \frac{1}{5} = 0,2$$

$$\frac{3}{2} = 1,5 \quad \frac{1}{25} = 0,04$$

$$\frac{2}{3} = 0,6$$

$$\frac{4}{9} = 0,4$$



② $R(t) = R_0 \cdot 4^t$ - rats

$P(t) = P_0 \cdot 2^t$ - persons

* 1992 $\begin{cases} 12000 \text{ persons (p)} \\ 4000 \text{ rats (r)} \end{cases}$

* ? $- r = p$

$$12000 \cdot 2^t = 4000 \cdot 4^t$$

$$12000 \cdot 2^t = 4000 \cdot 2^{2t}$$

$$12000 \cdot \log_{10} 2^t = 4000 \cdot \log_{10} 2^{2t}$$

$$\log_{10} (2^t)^{12000} = \log_{10} (2^{2t})^{4000}$$

$$12000 = 2^5 \cdot 3 \cdot 5^3$$

$$4000 = 2^3 \cdot 5^3 \cdot 4$$

$$\begin{aligned} \log_{10} 2^{12000t} &= \log_{10} 2^{14000t} \\ \log_{10} 2^{12000t} - \log_{10} 2^{14000t} &= 0 \end{aligned}$$

$$\log_{10} \left(\frac{2^{14000t}}{2^{12000t}} \right) = 0$$

$$\log_{10} 2^{2000t} = 0$$

③ $N(t) = \alpha \cdot 10^{\lambda t}$

$$N(0) = \alpha \cdot 10^{\lambda \cdot 0}$$

$$N(0) = \alpha \cdot 10^{0.71}$$

$$N(0) = \alpha$$

$$N(2) = \alpha \cdot 10^{\lambda 2}$$

$$2 = \alpha \cdot 10^{\lambda 2}$$

$$2 = 10^{\lambda 2}$$

$$\log 2 = \log 10^{\lambda 2}$$

$$\log 2 = 2\lambda \rightarrow \lambda = \frac{\log 2}{2}$$

$$N(6) = \alpha \cdot 10^{\lambda 6}$$

$$N(6) = \alpha \cdot 10^{\frac{\log 2}{2} \cdot 6}$$

$$N(6) = \alpha \cdot 10^{3 \cdot \log 2}$$

$$N(6) = \alpha \cdot 10^{\log 2^3}$$

$$N(6) = \alpha \cdot 10^{\log 8}$$

$$N(6) = \alpha \cdot 8$$

R: letra D

→ propiedad: $\beta \cdot \log_a b = \log_a b^\beta$

→ propiedad: $a^{\log_a b} = b$

④

x	y
-1	$-\frac{1}{2}$
1	1
2	3

} pontos retirados do gráfico

→ substituição

a) $y = 2^x - 1$

$x = -1 \rightarrow y = 2^{-1} - 1$ (V)

$y = \frac{1}{2} - 1 \rightarrow y = -\frac{1}{2}$

c) $y = \frac{2^x}{2}$

$x = -1 \rightarrow y = \frac{2^{-1}}{2}$

$y = \frac{1}{2} \rightarrow y = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ (F)

b) $y = x + \log x$

$x = -1 \rightarrow y = -1 + \log(-1)$

d) $y = 2^x + 1$ (F)

$x = -1 \rightarrow y = 2^{-1} + 1$

$y = \frac{1}{2} + 1 = \frac{3}{2}$

e) $y = 3^x$

$x = -1 \rightarrow y = 3^{-1}$ (F)

$y = \frac{1}{3}$

Após a 1ª substituição apenas a função da letra A foi verdadeira com os pontos do gráfico.

⑤

a) $y = -5^x + 2$

x	y
-2	$49/25 = 1.96$
-1	$9/5 = 1.8$
0	-1
1	-3
2	-23

$$\begin{aligned} \rightarrow y &= -5^{-2} + 2 \rightarrow y = -5^{-1} + 2 \\ &= -\frac{1}{25} + 2 = -\frac{1}{5} + 2 = \frac{9}{5} \\ &= \frac{49}{25} \end{aligned}$$

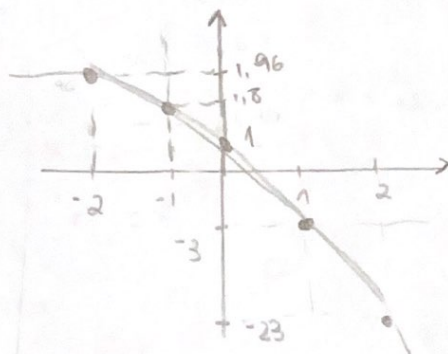
$$\begin{aligned} \rightarrow y &= -5^{-1} + 2 \\ &= -\frac{1}{5} + 2 = \frac{9}{5} \end{aligned}$$

$$\begin{aligned} \rightarrow y &= -5^1 + 2 \\ y &= -5 + 2 = -3 \end{aligned}$$

$$D = \mathbb{R}$$

$$Im = \{y \in \mathbb{R} / y > 2\}$$

asintota: 2
intercepto: (0, 1)



b) $y = \left(\frac{1}{3}\right)^x - 4$

x	y
-2	5
-1	-1
0	-3
1	$-11/3 \approx -3.6$
2	$-35/9 \approx -3.8$

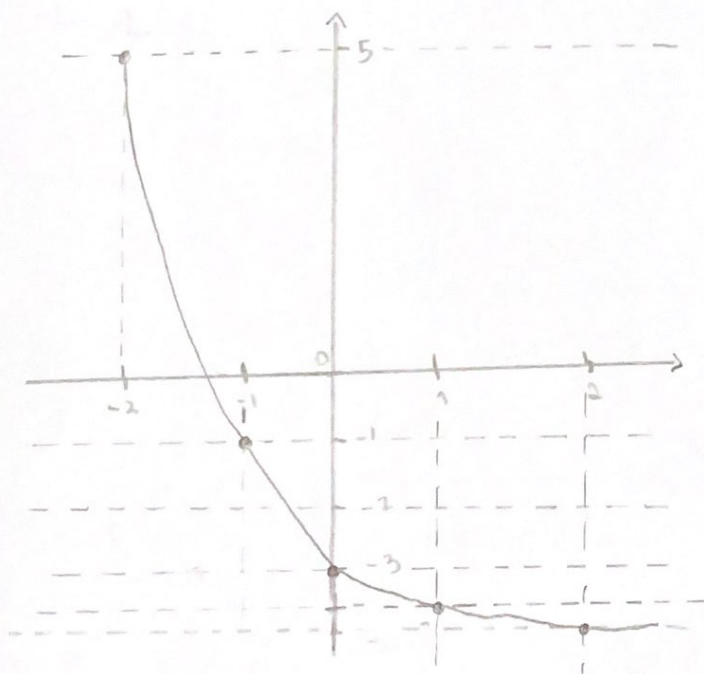
$$\begin{aligned} \rightarrow y &= \left(\frac{1}{3}\right)^{-2} - 4 \\ &= 3^2 - 4 \\ &= 9 - 4 = 5 \end{aligned}$$

$$\begin{aligned} \rightarrow y &= 1 - 4 \\ &= -3 \end{aligned}$$

$$\begin{aligned} \rightarrow y &= \left(\frac{1}{3}\right)^{-1} - 4 \\ &= 3 - 4 \\ &= -1 \end{aligned}$$

$$\begin{aligned} \rightarrow y &= \frac{1}{3} - 4 \\ &= \frac{1 - 12}{3} = -\frac{11}{3} \end{aligned}$$

$$\begin{aligned} \rightarrow y &= \left(\frac{1}{3}\right)^2 - 4 \\ &= \frac{1}{9} - 4 \\ &= \frac{1 - 36}{9} \\ &= -\frac{35}{9} \end{aligned}$$



intercepto: (0, -3)

$$D = \mathbb{R}$$

$$Im = \{y \in \mathbb{R} / y > -4\}$$

asintota: -4
[-4; +∞[

c)

$$y = 5^{\frac{3x-4}{2}} + 3 = 5^u + 3$$

u	x	y
-2	0	$76/25 = 3,04$
-1	$2/3$	$16/5 = 3,2$
0	$4/3$	4
1	2	8
2	$8/3$	28

$$u = \frac{3x-4}{2}$$

$$2u = 3x - 4$$

$$\frac{2u+4}{3} = x$$

$$u = -2$$

$$\frac{2 \cdot (-2) + 4}{3} = x$$

$$x = 0$$

$$u = 0$$

$$\frac{2 \cdot 0 + 4}{3} = x$$

$$x = 4/3$$

$$u = 2$$

$$\frac{2 \cdot 2 + 4}{3} = x$$

$$x = 8/3$$

$$u = -1$$

$$\frac{2 \cdot (-1) + 4}{3} = x$$

$$x = 2/3$$

$$u = 1$$

$$\frac{2 \cdot 1 + 4}{3} = x$$

$$x = 2$$

intercepto: $(0, 76/25)$

$D = \mathbb{R}$

$Im = \{y \in \mathbb{R} / y > 3\}$

asintota: 3

$$\frac{2}{3} = 0,6 \quad \frac{8}{3} = 2,6$$

$$\frac{4}{3} = 1,3$$

