



Exponencial – Anagramas – Limites

1) função exponencial [$e = 2.71828\dots$]

$$e^x = \frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$

2) anagramas usando a função exponencial

a partir do conjunto de letras ABBBB quantos anagramas

de 3 letras podemos formar?

3) limites da forma 0/0

limites para $x \rightarrow 1$ de $\frac{x^2 - 1}{x - 1}$, $\frac{x^3 - 1}{x - 1}$, $\frac{x^3 - 1}{x^2 - 1}$, $\frac{e^{(x^2 - 1)} - 1}{x - 1}$





$$e^x = \frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \dots$$

$\frac{x^0}{0!}$		1	1.000
$\frac{x^0}{0!} + \frac{x^1}{1!}$		2	2.000
$\frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!}$		5	2.500
$\frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!}$		8	2.667
$\frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$		3	
$\frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!}$		65	2.708
		24	
		163	2.717
		60	



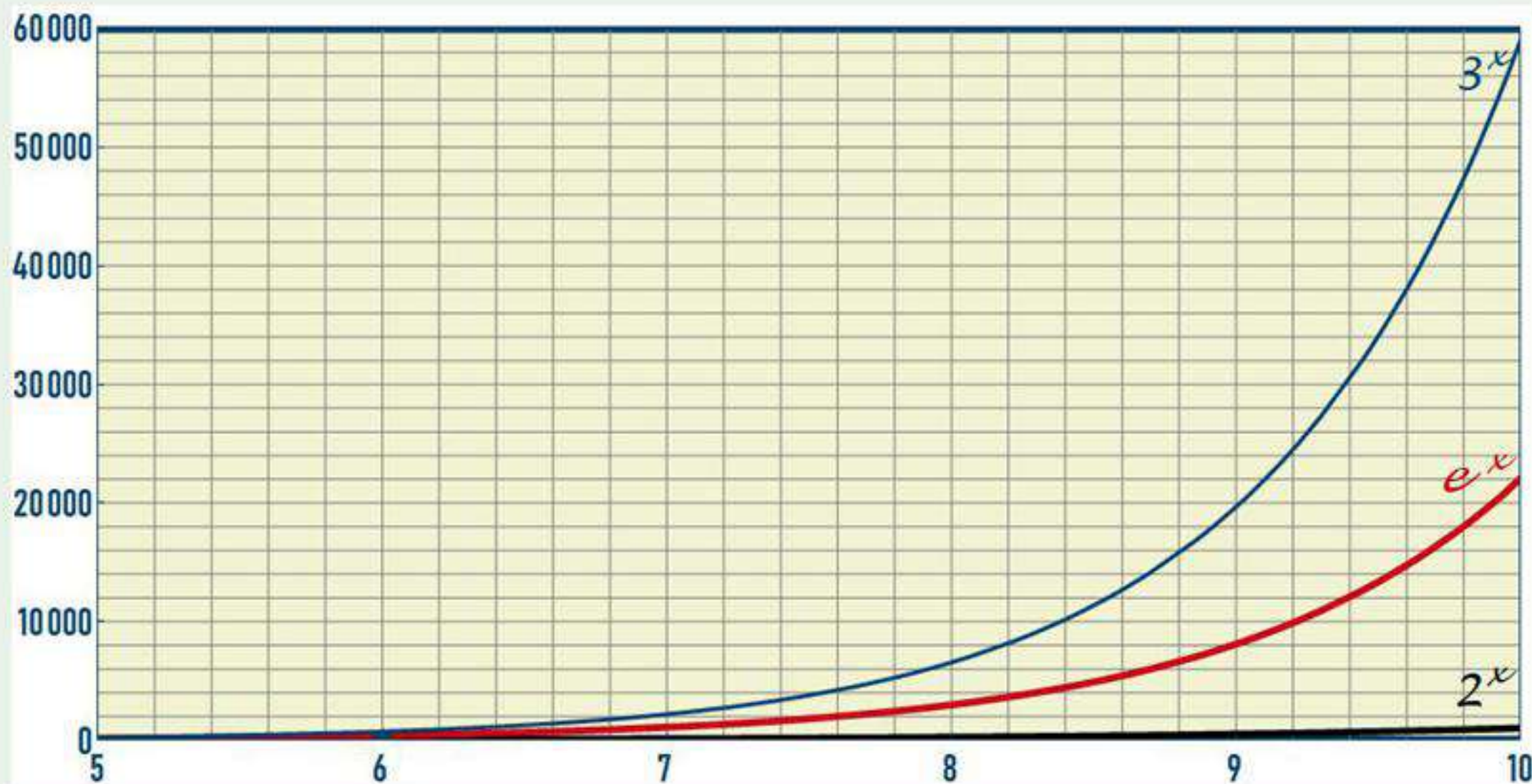


comparando a^x com x^a

x	x^2	2^x	x^3	3^x
1	1	2	1	3
2	4	4	8	9
3	9	8	27	27
4	16	16	64	81
5	25	32	125	243
6	36	64	216	729
7	49	128	343	2187
8	64	256	512	6561
9	81	512	729	19 683
10	100	1024	1000	59 049



Gráfico das funções: 2^x , e^x , 3^x





anagramas a partir do conjunto de letras: AABBB

$$A(x) = \frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} = 1 + x + \frac{x^2}{2}$$

$$B(x) = \frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} = 1 + x + \frac{x^2}{2} + \frac{x^3}{6}$$

$$A(x) B(x) = \left(1 + x + \frac{x^2}{2}\right) \left(1 + x + \frac{x^2}{2} + \frac{x^3}{6}\right) = 1 + 2x + 2x^2 + \frac{7}{6}x^3 + \frac{5}{12}x^4 + \frac{1}{12}x^5$$

$$A(x) B(x) = 1x^0 + 2x^1 + 2x^2 + \frac{7}{6}x^3 + \frac{5}{12}x^4 + \frac{1}{12}x^5$$

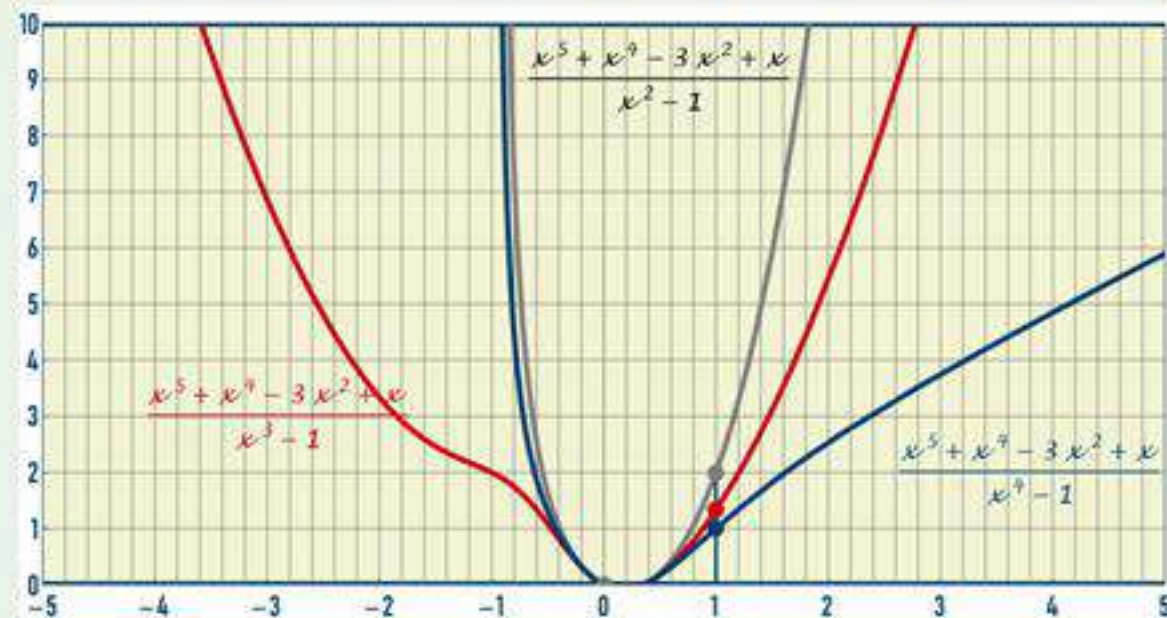
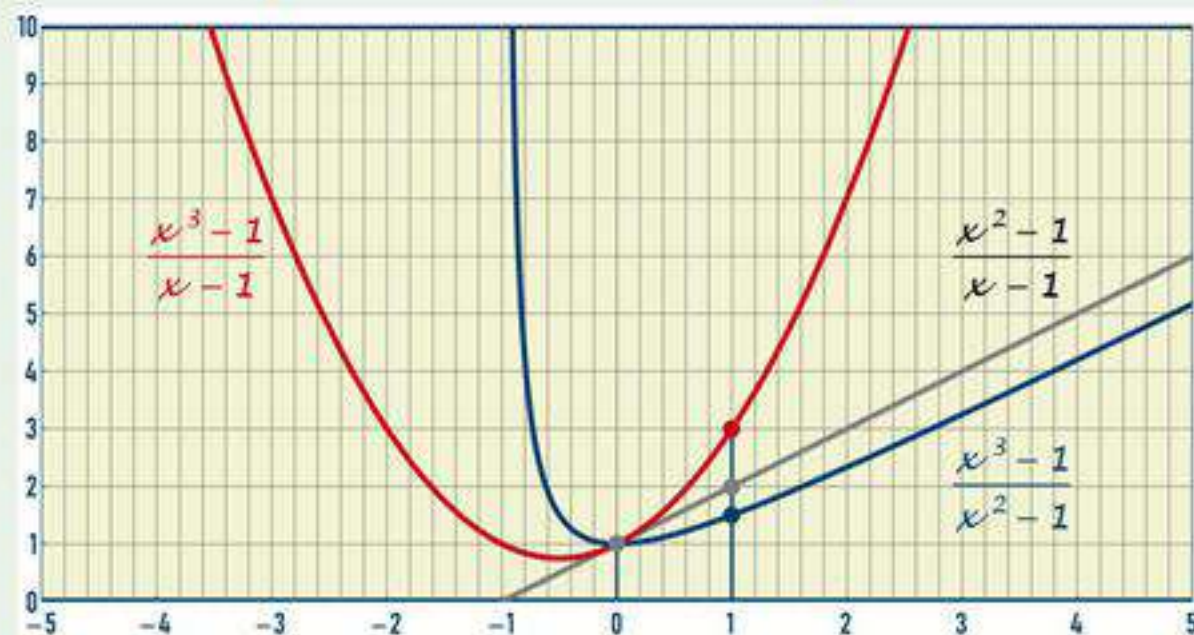
reconstruindo a base

$$A(x) B(x) = 1 \frac{x^0}{0!} + 2 \frac{x^1}{1!} + 2 \frac{x^2}{2!} + \frac{7}{6} \frac{x^3}{3!} + \frac{5}{12} \frac{x^4}{4!} + \frac{1}{12} \frac{x^5}{5!}$$

$$A(x) B(x) = 1 \frac{x^0}{0!} + 2 \frac{x^1}{1!} + 4 \frac{x^2}{2!} + 7 \frac{x^3}{3!} + 10 \frac{x^4}{4!} + 10 \frac{x^5}{5!}$$



limites para $x \rightarrow 0$ e para $x \rightarrow 1$





fórmulas de derivação que usaremos para calcular limites da forma 0/0

$$1) e^{f(x)} = f'(x) e^{f(x)}$$

$$2) f(x)^n = n f'(x) f(x)^{n-1}$$

$$3) \sin[f(x)] = f'(x) \cos[f(x)]$$

$$4) \cos[f(x)] = -f'(x) \sin[f(x)]$$

exemplos de limites para $x \rightarrow 0$ da forma 0/0

$$\frac{\sin(x)}{x}$$

$$1$$

$$\frac{e^x - 1}{x}$$

$$1$$

$$\frac{x^2}{1 - \cos(x)}$$

$$2$$

$$\frac{x^4}{e^{x^2} - 1}$$

$$0$$

$$\frac{\sin(x^4)}{1 - \cos(x^2)}$$

$$2$$

$$\frac{\sin(x)(1 - \cos(x))}{e^{x^3} - 1}$$

$$\frac{1}{2}$$

