

Cálculo Numérico - IME/UERJ

Gabarito - Lista de Exercícios 1 - Aritmética de ponto flutuante

1. (a) 19 (d) 1,5 (g) 12,25
 (b) 226 (e) 1,59375 (h) 0,328125
 (c) 65 (f) 12,625 (i) 0,890625
2. (a) 10111 (d) 10,1 (g) 1010,000011
 (b) 11111111 (e) 0.00011 (h) 111111,11001111010111000011
 (c) 101000110111 (f) 11,1100 (com 20 casas)
 (i) 0,1100

3. (a)

0	1	0	1	1	1	0	0	0	0	1	0	1
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$
- (b)

0	1	0	0	1	0	1	0	0	1	0	0	0
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$
- (c)

1	1	0	1	1	1	1	0	1	1	1	1	1
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$
- (d)

1	0	1	0	1	1	1	0	0	1	1	0	1
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$
- (e)

1	1	0	0	1	0	1	0	0	1	1	0	1
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$
- (f)

0	1	1	0	1	0	0	0	1	1	1	0	0
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$\underbrace{\hspace{1.5cm}}_{\text{s.n.}} \quad \underbrace{\hspace{2.5cm}}_{\text{expoente}} \quad \underbrace{\hspace{3.5cm}}_{\text{mantissa}}$

4. (a) (3-a) 266; (3-b) 12,5 (exato); (3-c) -446; (3-d) 0,10009765625
 (3-e) -12,8125 (3-f) 2496
- (b) Maior número positivo

0	1	1	1	1	0	1	1	1	1	1	1	1
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s.n. expoente mantissa

$$1,1111111 \times 2^{15} = (65280)_{10}$$

Menor número positivo (o número positivo mais próximo de zero está na forma desnormalizada)

0	0	0	0	0	0	0	0	0	0	0	0	1
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s.n. expoente mantissa

$$0,0000001 \times 2^{-14} = 2^{-21} \approx 4,7684 \times 10^{-7}$$

(c) 100,5

(d) 19,875

- (e) $m = 1,1001100 \times 2^4$ (exato - $E_{abs} = E_{rel} = 0$);
 $n = 1,1110001 \times 2^6 = 120,5$ ($E_{abs} = 0,25$, $E_{rel} \approx 2,0790 \times 10^{-3}$);
 $p = 1,0100000 \times 2^1$ (exato - $E_{abs} = E_{rel} = 0$);
 $a = 1,1100110 \times 2^8 = 460$ ($E_{abs} = 0,25$, $E_{rel} \approx 5,4318 \times 10^{-4}$);
 $b = 1,1100010 \times 2^8 = 452$ ($E_{abs} = 1,25$, $E_{rel} \approx 2,773 \times 10^{-3}$).

5. (a) Menor número positivo (o número positivo mais próximo de zero está na forma desnormalizada)

0	0	0	0	0	0	0	0	0	0	0	1
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s.n. expoente mantissa

$$0,000001 \times 2^{-14} = 2^{-20} \approx 9,5367 \times 10^{-7}$$

Maior número positivo

0	1	1	1	1	0	1	1	1	1	1	1
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s.n. expoente mantissa

$$1,111111 \times 2^{15} = (2 - 2^{-6}) \times 2^{15} = 65024$$

(b) $e \approx 10,000000 \times 2^{-6} = 2^{-5} = 0,03125$.

(c) $1,000101 \times 2^2 = (100,0101)_2 = 4,3125$.

(d) $1,001111 \times 2^6 = (1001111)_2 = 79$.

(e) $(0,8)_{10} = (0,110011001100...)_{2} = 1,100110 \times 2^{-1}$

$$(5)_{10} = (101)_2 = 1,010000 \times 2^2$$

$$0,8 \times 5 = 1,111111 \times 2^1 \approx 10,000000 \times 2^1 = 1,000000 \times 2^2 = 4,0.$$