

1. Floating point arithmetic

Consider $\beta = 2, t = 3, e_{\min} = -2, e_{\max} = 2$

- What are the normalized floating point numbers?
- What are the subnormal numbers?
- How is $7/10$ represented? What is the relative error?
- How is $7/10$ represented in $\beta = 2, t = 4, e_{\min} = -2, e_{\max} = 2$?
What is the relative error?
- How is $7/10$ represented in $\beta = 2, t = 3, e_{\min} = -2, e_{\max} = 3$?
What is the relative error?
- What is the first integer that cannot be represented?
- ...

2. Matlab

2.1)

Write a recursive Matlab function `H` that takes as input an integer $n \geq 0$, and returns as output the matrix H_n defined on the right. `while` and `for` loops are not allowed.

$$H_n = \begin{bmatrix} n & n & n & \dots & n & n \\ n & n-1 & n-1 & \dots & n-1 & n-1 \\ n & n-1 & n-2 & \dots & n-2 & n-2 \\ \vdots & \vdots & \vdots & \ddots & & \vdots \\ n & n-1 & n-2 & & 1 & 1 \\ n & n-1 & n-2 & \dots & 1 & 0 \end{bmatrix}$$

2.2)

M =

1	5	9	13	17
2	6	10	14	18
3	7	11	15	19
4	8	12	16	20

M(???) = M (???)

M =

1	5	9	13	17
20	16	12	8	4
3	7	11	15	19
18	14	10	6	2

What is the assignment that transforms the matrix M as shown?

2.3)

The following expressions are evaluated in Matlab. What is the result?

- a) [1 point] `sqrt(sqrt(sqrt(sqrt((((2^2)^2)^2)^2))))`
- b) [1 point] `sqrt(sqrt(sqrt(sqrt(2^(2^(2^(2^2)))))))`
- c) [1 point] `[pi,[pi,pi],pi]*[1 -1 1 -1]'`