C Programming

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TP 00

Exercice 1:

Write the following functions:

- A function that takes two matrices of the same size, returns their sum.
- A function that takes two matrices of the same size, returns their multiplication.
- A function that takes a matrix, returns its transpose.
- A function that takes a matrix of dimension n * n, returns a Matrix of dimension 2 * n that contains its diagonals.

Your functions must be declared as follows:

```
float **sum_m(float **A, float **B, int n);
float **mult_m(float **A, float **B, int n);
float **trans_m(float **A, int n);
float **dia_m(float **A, int n);
```

Exercice 2:

Write an implementation of Dichotomie function, that takes a function f (strictly increasing and continuous), two decimals a and b (bounds the initial interval), and the number of iterations n.
The function should return αn an approximation of α such as $f(\alpha) = 0$. And it should be declared as follows:

```
float Dichotomie(float(*f)(float), float a, float b, int n);
```

Exercice 3:

Write an implementation of Newton function, that takes a function f, its derivative g, an initial value $\alpha 0$, and the number of iterations n.
The function should return αn an approximation of α such as $f(\alpha) = 0$

Exercice 4:

Using Dichotomie function previously implemented, write a fucntion Dichotomie2, that takes a function f (strictly increasing and continuous), two decimals a and b (bounds the initial interval), and a decimal ϵ (represents the margin of error). The function should return αn an approximation of α such as $f(\alpha) = 0$. $(|\alpha n - \alpha| <= \epsilon)$.

Exercice 5:

Using the previously implemented functions, calculate αn the approximation of $\sqrt{2}$, with $a = 0, b = 3, \alpha 0 = 3, n = 3, 10, 30$.

Exercice 6:

- Construct an array of the values αn, the approximations of α such as $\alpha^3 - \alpha - 3 = 0$ for each $n \in [0, n]$.
- (bonus) Plot the results(you can use gnuplot).