Universidad Industrial de Santander, Colombia
Numerical Analysis, 2020-1
Henry Arguello
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Lab 6. Interpolation

1 Instructions

- Make a **pdf** report including the solution to each point of the practice with name *Lab6_name_lastname.pdf*.
- Send the report and all created files in a rar or zip file with name *Lab6_name_lastname.rar* in the Moodle.
- You are allowed to use internet, notes, and .m files that you have created before.

2 Purposes

- To understand the interpolation and polynomial approximation methods.
- To implement the Lagrange and Newton polynomials.

3 Practice

3.1 Understanding

Answer with your own words the following questions:

- (0.2 points) What is interpolation?

  La interpolación es un campo del analisis numérico que permite hallar la expresión analitica de una función f(x) que permita aproximar a otra función f(x) para x en un intervalo [a,b].

- (0.2 points) How to calculate the Lagrange and Newton interpolation?

  La interpolación lineal consiste en trazar una recta que pasa por dos puntos conocidos y = r(x) y calcular los valores intermedios según esta recta. Luego se aplicará la formula de intepolación y=y1+((y2-y1)/(x2-x1))(x-x1), la cual se aproximará en cada iteración.

- (0.2 points) What applications does the interpolation?

Se utiliza en ciencias e ingenieria en experimientos donde los datos arrojados se pueden representar como tablas o de manera grafica.

3.2 Implementing

- (1.5 points) Create a Matlab function called *my_LagrangePolynomial_name_lastname()* to find the coefficients of the Lagrange interpolating polynomial C. The arguments of the function must be: a set of points (X,Y). For instance,

```
[ C ] =my_LagrangePolynomial_name_lastname(X,Y);
```

- (1.5 points) Create a Matlab function called *my_NewtonPolynomial_name_lastname()* to find the coefficients of the Newton interpolating polynomial C. The arguments of the function must be: a set of points (X,Y). For instance,

```
[ C ] =my_NewtonPolynomial_name_lastname(X,Y);
```

- (1.0) Use the created functions for Lagrange and Newton polynomial to find each interpolating polynomial based on $f(x) = 3\sin^2(\pi x/6)$ with $x_0 = 0$, $x_1 = 1$, $x_2 = 2$, $x_3 = 3$, and $x_4 = 4$.

- (1.0) In the same plot, compare Lagrange and Newton interpolating polynomials regarding to the real function $f(x) = 3\sin^2(\pi x/6)$. Also, illustrate the given points (x_k, y_k). Discuss about what you observe.