**CS407 Exam**

1. Given the points (1,5), (2,1) and (3,3), fill in the matrix with those values which would result in a quadratic interpolating polynomial passing thru the given points:
2. Solve the system in the previous question:

a = **3**

b = **-13**

c = **15**

1. Construct a linear LaGrange interpolating polynomial passing thru the points x0 = (0,2) and x1 = (π/3,1) by providing the following:

L0(x) = **(x-x1)/(x0-x1)=(x-π/3)/(0-π/3)**

L1(x) = **(x-x0)/(x1-x0)=(x-0)/(π/3-0)**

(Show steps toward simplification here)

**(No credit will be given without the steps)**

**P(x) = f(x0)\*L0(x) + f(x1)\*L1(x)**

**= 2\*(x-π/3)/(0-π/3))+1\*((x-0)/(π/3-0))**

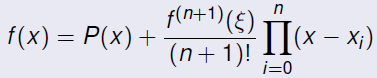
**= 2\*(x-π/3)/(-π/3)+x/(π/3)**

**= -3/π\*(2x-2π/3)+3x/π**

**= -6x/π+2~~π/π~~+3x/π**

**= -3x/π + 2**

1. Suppose that the underlying function in the previous question is f(x) = 2cos(x); use the fact that



where the interval is [0,π/2], and n = 1 to establish a bound on the absolute error in this way:

What is the maximum value of |f”(ξx)/2!| on the interval? **1**

What is the maximum value of ||on the interval? **π2/36**

Using this information, what is a bound on the absolute error? **π2/36**

1. The following table is a series of approximations of f(0.85) where f is some unknown function using Neville’s method; complete the last 2 columns and rows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Interpolations of order:** | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** |
| **x** | **f(x)** |  |  |  |  |  |  |
| **0** | **1.00000** |  |  |  |  |  |  |
| **0.25** | **0.70711** | 0.00417 |  |  |  |  |  |
| **0.5** | **0.00000** | -0.98995 | -1.68584 |  |  |  |  |
| **0.75** | **-0.70711** | -0.98995 | -0.98995 | -0.89717 |  |  |  |
| **1** | **-1.00000** | -0.82427 | -0.87397 | -0.89717 | -0.89717 |  |  |
| **1.25** | **-0.70711** | 1.1757340 | 0.8945596 | 0.8835798 | 0.8890153 | 0.8916244 |  |
| **1.5** | **0.00000** | 1.8384860 | 0.9769084 | 0.9055394 | 0.8912656 | 0.8900955 | 0.8907580 |

1. If the underlying function in the previous question is revealed to be f(x) = cos(πx), what is the value in the table closest to the actual value? **0.8907580**