Homework Feedback 7

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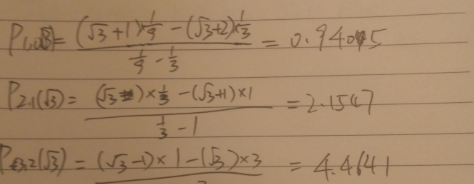
**P. 119 #5** Use Neville's method to approximate with the function and the values .

**Answer:** since , we need to approximate at x . Specifically, It amounts to :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0.111111 |  |  |  |  |
|  | 0.333333 | 0.666666 |  |  |  |
|  | 1 | 1.333335 | 1.500000 |  |  |
|  | 3.00000 | 2.00000 | 1.833334 | 1.777778 |  |
|  | 9.00000 | 0.00000 | 1.500000 | 1.666667 | 1.7083 |

**Typical Errors:**

Some students compute as the answer:



**P. 120 #17** Suppose you need to construct eight-decimal-place tables for the common, or base-10, logarithm function from x = 1 to x = 10 in such a way that linear interpolation is accurate to

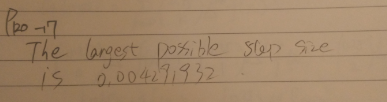
within 10-6. Determine a bound for the step size for this table. What choice of step size would

you make to ensure that x = 10 is included in the table?

**Answer:** Sincewe are doing linear interpolation, we have the following error estimation formula (see ppt NA06\_Ch3\_B.ppt):

For base-10 logarithm function from x = 1 to x = 10, we have: . Therefore, the error has the upper bound . If we want to make sure x=10 is included in the table, h can be 0.004.

**Typical Errors:**  Without detailed proof for the result. For example:



**P. 131 #5** a. Approximate f(0.05) using the following data and the Newton forward divided difference formula:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | 0.0 | 0.2 | 0.4 | 0.6 | 0.8 |
| f(x) | 1.0000 | 1.22140 | 1.49182 | 1.82212 | 2.22554 |

b. Use the Newton backward divided-difference formula to approximate f(0.65).

**Answer:** (a) First, we need to compute the forward divided difference as the coefficients of the polynomial. The polynomial should be of 4-th order since we have 5 points.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1.0000 |  |  |  |  |
|  | 1.22140 | 1.1070 |  |  |  |
| .4 | 1.49182 | 1.3521 | 0.61275 |  |  |
|  | 1.82212 | 1.6515 | 0.7485 | 0.22625 |  |
|  | 2.22554 | 2.0171 | 0.914 | 0.27583 | 0.061795 |

Therefore, the 5 coefficients are 1.000,1.1070 , 0.61275, 0.22625, 0.061795.

(b) Compute the coefficients similarly with backward divided difference, we get .

**P. 132 #13** For a function , the forward divided differences are given by,

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Determine the missing entries in the table.

**Answer:** Since , we have = 3. Similarly, we can get = 5 and 1.