

# Numerical Interpolation

**Talk to a Teacher Project**

**<http://spoken-tutorial.org>**

**National Mission on Education through ICT**

**<http://sakshat.ac.in>**

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- **Calculate the function from the given points**



# System Requirements

- OS: Ubuntu Linux 12.04



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- **Scilab 5.3.3**



# Prerequisites

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- **Interpolation using numerical methods**
- **Please refer to the relevant Scilab tutorials available on <http://spoken-tutorial.org>**



# Numerical Interpolation

- **Method of constructing new data points**



# Numerical Interpolation

- **Method of constructing new data points**
- **Within the range of a discrete set of known data points**



# Numerical Interpolation

- Method of constructing new data points
- Within the range of a discrete set of known data points
- Solve interpolation problems using numerical methods



# Lagrange Interpolation

- **pass a polynomial**



# Lagrange Interpolation

- pass a polynomial
- degree  $N - 1$



# Lagrange Interpolation

- pass a polynomial
- degree  $N - 1$
- $N$  points



# Lagrange Interpolation

- pass a polynomial
- degree  $N - 1$
- $N$  points
- Find the unique order  $N$  polynomial  $y(x)$  which interpolates the samples



# Example

- **Compute  $\ln 9.2$  from**

$$\ln 9.0 = 2.1792$$

$$\ln 9.5 = 2.2513$$

$$\ln 11.0 = 2.3979$$



# Newton's Divided Difference Method

- Uses Divided differences recursive method



# Newton's Divided Difference Method

- **Uses Divided differences recursive method**
- **Lesser number of computations than Lagrange method**



# Newton's Divided Difference Method

- Uses Divided differences recursive method
- Lesser number of computations than Lagrange method
- Same polynomial



# Example

- Find the value of  $f(3)$  for the given data

$$x = 2, f(x) = 0.5$$

$$x = 2.5, f(x) = 0.4$$

$$x = 3.25, f(x) = 0.3077$$

$$x = 4, f(x) = 0.25$$



# Summary

**In this tutorial, we have learnt to:**

- **Develop Scilab code for interpolation methods**
- **Find the value of function at new data point**



# Assignment

**Find  $y$  for  $x = 3.5$  for the given  $(x, y)$  pairs:**

$(0, 15), (1, 10), (2, 9), (3, 6), (4, 2), (5, 0)$



# About the Spoken Tutorial Project

- Watch the video available at [http://spoken-tutorial.org/What\\_is\\_a\\_Spoken\\_Tutorial](http://spoken-tutorial.org/What_is_a_Spoken_Tutorial)
- It summarises the Spoken Tutorial project



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# Spoken Tutorial Workshops

## The Spoken Tutorial Project Team

- Conducts workshops using spoken tutorials
- Gives certificates to those who pass an online test
- For more details, please write to [contact@spoken-tutorial.org](mailto:contact@spoken-tutorial.org)



# Acknowledgements

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- More information on this Mission is available at

<http://spoken-tutorial.org/NMEICT-Intro>

