

Hybrid 3 – Lagrange Interpolation

1. Find the interpolation at $x = 1.0$ for the following data

x	-1	0	2	4
y	1	0	1	2

Interpolation

$$f(x) = \frac{(x-0)(x-2)(x-4)}{(-1-0)(-1-2)(-1-4)} 1 + \frac{(x--1)(x-2)(x-4)}{(0--1)(0-2)(0-4)} 0 + \frac{(x--1)(x-0)(x-4)}{(2--1)(2-0)(2-4)} 1 + \frac{(x--1)(x-0)(x-2)}{(4--1)(4-0)(4-2)} 2$$

At $x=1.0$

$$f(1.0) = \frac{(1-0)(1-2)(1-4)}{(-1-0)(-1-2)(-1-4)} 1 + \frac{(1--1)(1-2)(1-4)}{(0--1)(0-2)(0-4)} 0 + \frac{(1--1)(1-0)(1-4)}{(2--1)(2-0)(2-4)} 1 + \frac{(1--1)(1-0)(1-2)}{(4--1)(4-0)(4-2)} 2$$

$$= \frac{(1)(-1)(-3)}{(-1)(-3)(-5)} 1 + \frac{(2)(-1)(-3)}{(1)(-2)(-4)} 0 + \frac{(2)(1)(-3)}{(3)(2)(-2)} 1 + \frac{(2)(1)(-1)}{(5)(4)(2)} 2$$

$$= \frac{3}{-15} 1 + \frac{6}{8} 0 + \frac{-6}{-12} 1 + \frac{-2}{40} 2 = -\frac{1}{5} + \frac{1}{2} - \frac{1}{10} = 0.2$$