SPLINE

1. กำหนดตารางความสัมพันธ์ระหว่างค่า x และ y ได้ดังตาราง

จุดที่	x	y
1	2	9.5
2	4	8.0
3	6	10.5
4	8	39.5
5	10	72.5

จงหาค่า y = f(x) เมื่อ x = 4.5 ด้วยวิธี

1.1 LINEAR SPLINE พร้อมเขียน code

find slope :

$$m_0 = \frac{y_1 - y_0}{x_1 - x_0} = \frac{8.0 - 9.5}{4 - 2} = -0.750000$$

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10.5 - 8.0}{6 - 4} = 1.250000$$

$$m_2 = \frac{y_3 - y_2}{x_3 - x_2} = \frac{39.5 - 10.5}{8 - 6} = 14.5000000$$

$$m_3 = \frac{y_4 - y_3}{x_4 - x_3} = \frac{72.5 - 39.5}{10 - 8} = 16.500000$$

m [-0.750000, 1.250000, 14.500000, 16.500000]

find linear spline :

$$f_1(x) = f(x_0) + m_0(x - x_0)$$

$$= 9.5 + -0.750000\,(4.5 - 2)$$

$$= 7.625000$$

err = $x_0 \leq x \leq x_1$

= 2 ✓ ≤ 4.5 ≤ 4 ✗

$$f_2(x) = f(x_1) + m_1(x - x_1)$$

$$= 8.0 + 1.250000\,(4.5 - 4)$$

$$= 8.625000$$

err = $x_1 \leq x \leq x_2$

= 4 ✓ ≤ 4.5 ≤ 6 ✓

result = 8.625000

```js
const math = require("mathjs")

function linear_spline(points,x){
    let m = math.clone(points)
    for(let i=1;i<math.size(points);i++){
        m[i-1].slope = (points[i].y - points[i-1].y) / (points[i].x - points[i-1].x);
    }

    for(let i=1;i<math.size(points);i++){
        if(x >= points[i-1].x && x <= points[i].x){
            return points[i-1].y + m[i-1].slope * (x - points[i-1].x)
        }
    }

    return null
}

let points = [
    {x: 2,y: 9.5},
    {x: 4,y: 8.0},
    {x: 6,y: 10.5},
    {x: 8,y: 39.5},
    {x: 10,y: 72.5}
]

let x=4.5

console.log(linear_spline(points,x))
```

```
[Running] node "c:\Users\MRTee\Documents\GitHub\numerical-method\linear-spline\linear-spline.js"
8.625

[Done] exited with code=0 in 1.84 seconds
```