Exercise 4.1

Neighboring Radius = 3; Exponent $p = 2$

P7:

With a radius of 3 the following points are considered as neighbors to P7 for the Shepard Interpolation. The List below also includes the distance of each in regards to P7.

- P1

  $$d(P7, P1) = |P7 - P1| = \sqrt{1{,}5^2 + 1^2} = \sqrt{3{,}25}$$
- P2

  $$d(P7, P2) = \sqrt{1{,}5^2 + (-1)^2} = \sqrt{3{,}25}$$
- P3

  $$d(P7, P3) = \sqrt{(-0{,}5)^2 + 0^2} = 0{,}5$$
- P4

  $$d(P7, P4) = \sqrt{(-1{,}5)^2 + (-2)^2} = 2{,}5$$

With this we can interpolate the Value at P7 as follows

$$u(x) = \sum_i \frac{w_i(x) * d_i}{\sum_j w_j(x)},$$
$$where\ w_i(x) = \frac{1}{d(x_i, x)^p}$$

$$u(P7) = \frac{\frac{1}{3{,}25} * 10 + \frac{1}{3{,}25} * 9 + \frac{1}{0{,}25} * 4 + \frac{1}{6{,}25} * 7}{4{,}775} \approx 4{,}8$$

P8:

- P3

  $$d(P8, P3) = |P8 - P3| = \sqrt{1{,}5^2 + 0^2} = 1{,}5$$
- P4

  $$d(P8, P4) = \sqrt{0{,}5^2 + (-2)^2} = \sqrt{4{,}25}$$
- P5

  $$d(P8, P5) = \sqrt{(-1{,}5)^2 + 0^2} = 1{,}5$$
- P6

  $$d(P8, P6) = \sqrt{(-0{,}5)^2 + 2^2} = \sqrt{4{,}25}$$

$$u(P8) = \frac{\frac{1}{2{,}25} * 4 + \frac{1}{4{,}25} * 7 + \frac{1}{2{,}25} * 11 + \frac{1}{4{,}25} * 13}{1{,}359} \approx 8{,}4$$