WU #22 - Local Regression (loess)

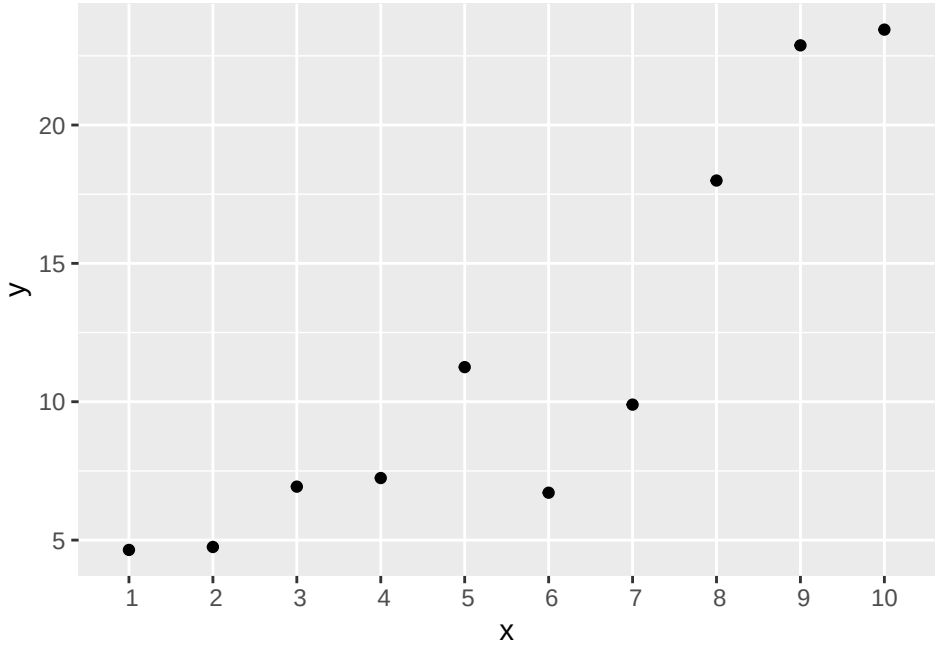
Math 158 - Jo Hardin

Tuesday 4/26/2022

Name: _____

Names of people you worked with: _____

Consider the very simple dataset given below.



Consider the tricubic weight function:

$$K_{i0} = \left(1 - \left(\frac{d(x_i, x_0)}{\max_{i \in S} d(x_i, x_0)}\right)^3\right)^3 I\left[d(x_i, x_0) < \max_{i \in S} d(x_i, x_0)\right]$$

Consider using a span of 30%.

1. Find the 10 weights associated with a prediction at $x_0 = 1$.
2. Find the 10 weights associated with a prediction at $x_0 = 3$.

Solution:

1. There will be 5 non-zero weights and $K_{i0} = 0 \;\; i \geq 6$.

$$\max_{i \in S} d(x_i, 1) = d(x_5, 1) = 4$$

$$K_{10} = (1 - (0)^3)^3 = 1$$

$$K_{20} = \left(1 - \left(\frac{1}{4}\right)^3\right)^3 = 0.953$$

$$K_{30} = \left(1 - \left(\frac{2}{4}\right)^3\right)^3 = 0.670$$

$$K_{40} = \left(1 - \left(\frac{3}{4}\right)^3\right)^3 = 0.193$$

$$K_{50} = \left(1 - \left(\frac{4}{4}\right)^3\right)^3 = 0$$

2. Again, there will be 5 non-zero weights and $K_{i0} = 0 \;\; i \geq 6$.

$$\max_{i \in S} d(x_i, 3) = d(x_1, 3) = d(x_5, 3) = 2$$

$$K_{10} = \left(1 - \left(\frac{2}{2}\right)^3\right)^3 = 0$$

$$K_{20} = \left(1 - \left(\frac{1}{2}\right)^3\right)^3 = 0.670$$

$$K_{30} = \left(1 - \left(\frac{0}{2}\right)^3\right)^3 = 1$$

$$K_{40} = \left(1 - \left(\frac{1}{2}\right)^3\right)^3 = 0.670$$

$$K_{50} = \left(1 - \left(\frac{2}{2}\right)^3\right)^3 = 0$$