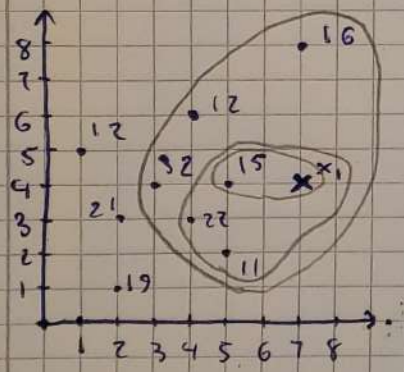
Exercise 3 (kNN regression) - SOLUTION

$$T = \left\{ \left(\begin{pmatrix} 2 \\ 1 \end{pmatrix}, 19 \right), \left(\begin{pmatrix} 2 \\ 3 \end{pmatrix}, 21 \right), \left(\begin{pmatrix} 4 \\ 3 \end{pmatrix}, 22 \right), \left(\begin{pmatrix} 5 \\ 2 \end{pmatrix}, 11 \right), \left(\begin{pmatrix} 5 \\ 4 \end{pmatrix}, 15 \right), \right.$$
$$\left. \left(\begin{pmatrix} 6 \\ 6 \end{pmatrix}, 12 \right), \left(\begin{pmatrix} 3 \\ 4 \end{pmatrix}, 32 \right), \left(\begin{pmatrix} 1 \\ 5 \end{pmatrix}, 12 \right), \left(\begin{pmatrix} 7 \\ 8 \end{pmatrix}, 16 \right) \right\}$$

Perform kNN regression for $x_1 = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$, $x_2 = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $x_3 = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$ with $k=1$, $k=3$ and $k=6$.

① $x_1 = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$



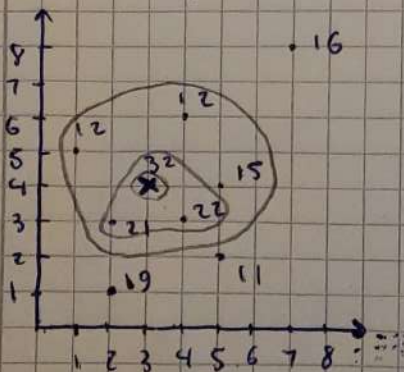
$k=1 \Rightarrow f((7,4)^T) = \underline{15}$

$k=3 \Rightarrow f((7,4)^T) = \frac{11+15+22}{3} = \underline{16}$

$k=6 \Rightarrow f((7,4)^T) = \frac{11+15+22+12+32+16}{6}$

$= \underline{18}$

② $x_2 = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$



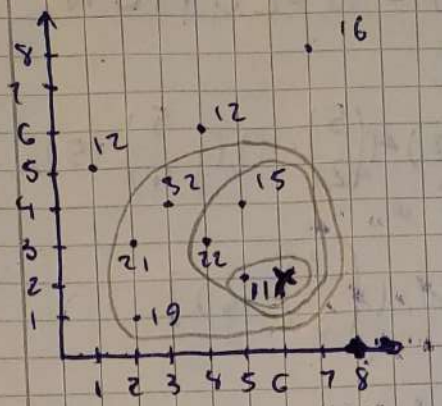
$k=1 \Rightarrow f((3,4)^T) = \underline{32}$

$k=3 \Rightarrow f((3,4)^T) = \frac{32+21+22}{3} = \underline{25}$

$k=6 \Rightarrow f((3,4)^T) = \frac{32+21+22+15+12+12}{6}$

$= \underline{19}$

③ $x_3 = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$



$k=1 \Rightarrow f((6,2)^T) = 11$

$k=3 \Rightarrow f((6,2)^T) = \frac{11+22+15}{3} = 16$

$k=6 \Rightarrow f((6,2)^T) = \frac{11+22+15+32+21+19}{6}$

$= 20$