1. $e = y - Xb$

$$e_1 = \begin{pmatrix} 15.1 \\ 7.9 \\ 4.5 \\ 12.8 \\ 10.5 \end{pmatrix} - \begin{pmatrix} 1 & 25.5 & 1.23 \\ 1 & 40.8 & 1.89 \\ 1 & 30.2 & 1.55 \\ 1 & 4.3 & 1.18 \\ 1 & 10.7 & 1.68 \end{pmatrix} \cdot \begin{pmatrix} 23 \\ 0.1 \\ -8 \end{pmatrix} = \begin{pmatrix} 15.1 - 1 \cdot 23 - 25.5 \cdot 0.1 - 1.23 \cdot -8 \\ 7.9 - 1 \cdot 23 - 40.8 \cdot 0.1 - 1.89 \cdot -8 \\ 4.5 - 1 \cdot 23 - 30.2 \cdot 0.1 - 1.55 \cdot -8 \\ 12.8 - 1 \cdot 23 - 4.3 \cdot 0.1 - 1.18 \cdot -8 \\ 10.5 - 1 \cdot 23 - 10.7 \cdot 0.1 - 1.68 \cdot -8 \end{pmatrix} = \begin{pmatrix} -0.61 \\ -4.06 \\ -9.12 \\ -1.19 \\ 0.13 \end{pmatrix}$$

$$e_2 = \begin{pmatrix} 15.1 \\ 7.9 \\ 4.5 \\ 12.8 \\ 10.5 \end{pmatrix} - \begin{pmatrix} 1 & 25.5 & 1.23 \\ 1 & 40.8 & 1.89 \\ 1 & 30.2 & 1.55 \\ 1 & 4.3 & 1.18 \\ 1 & 10.7 & 1.68 \end{pmatrix} \cdot \begin{pmatrix} 22 \\ -0.2 \\ -7 \end{pmatrix} = \begin{pmatrix} 15.1 - 1 \cdot 22 - 25.5 \cdot -0.2 - 1.23 \cdot -7 \\ 7.9 - 1 \cdot 22 - 40.8 \cdot -0.2 - 1.89 \cdot -7 \\ 4.5 - 1 \cdot 22 - 30.2 \cdot -0.2 - 1.55 \cdot -7 \\ 12.8 - 1 \cdot 22 - 4.3 \cdot -0.2 - 1.18 \cdot -7 \\ 10.5 - 1 \cdot 22 - 10.7 \cdot -0.2 - 1.68 \cdot -7 \end{pmatrix} = \begin{pmatrix} 6.81 \\ 7.29 \\ -0.61 \\ -0.08 \\ 2.4 \end{pmatrix}$$

2 b_1: $\sum_{i=1}^{5} |e_i| = 15.11$ $\quad \sum_{i=1}^{5} e_i^2 = 101.46$

b_2: $\sum_{i=1}^{5} |e_i| = 17.19$ $\quad \sum_{i=1}^{5} e_i^2 = 105.66$

3. $\underset{(1\times p)}{u} \cdot \underset{(p\times q)}{A} \cdot \underset{(q\times 1)}{v} = \underset{(1\times 1)}{d}$ $\qquad d = u \cdot A \cdot v = \sum_{i=1}^{p} \sum_{j=1}^{q} u_i A_{ij} v_j$

4. $(A + I)^2 = A^2 + AI + IA + I^2 = A^2 + 2A + I$