

**Question:** Let  $\sigma, \tau \in S_9$  be given by

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 3 & 1 & 7 & 9 & 6 & 5 & 2 & 4 & 8 \end{pmatrix} \quad \text{and} \quad \tau = (1\ 5)(3\ 2\ 4\ 8\ 9).$$

1. Write the complete factorization of  $\sigma$  into disjoint cycles.
2. Compute  $\sigma^{-1}$ . [Your answer can be in matrix or disjoint cycles form.]
3. Compute  $\tau\sigma$ . [Your answer can be in matrix or disjoint cycles form.]
4. Compute  $\sigma\tau\sigma^{-1}$ . [Your answer can be in matrix or disjoint cycles form.]
5. Write  $\tau$  as a product of transpositions.
6. Compute  $\text{sign}(\tau)$ .