Properties of determinant

- The determinant of the transpose of a square matrix is equal to the determinant of the matrix.

  Example:

  $$\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} \qquad \Delta' = \begin{vmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{vmatrix}$$

  By 1st row, $\Delta = a_{11}M_{11} - a_{12}M_{12} + a_{13}M_{13}$

  By 1st column, $\Delta' = a_{11}M_{11} - a_{12}M_{12} + a_{13}M_{13}$

  $\Delta = \Delta'$

  Value of determinant doesn't change
  by interchanging rows with column