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## Hessenberg matrix

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Classification	msc 65-00
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Synonym	upper Hessenberg matrix
Synonym	lower Hessenberg matrix
Synonym	upper Hessenberg
Synonym	lower Hessenberg

An *upper Hessenberg matrix* is of the form

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1,n-1} & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2,n-1} & a_{2n} \\ 0 & a_{32} & a_{33} & \cdots & a_{3,n-1} & a_{3n} \\ 0 & 0 & a_{43} & \cdots & a_{4,n-1} & a_{4n} \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & a_{n,n-1} & a_{nn} \end{bmatrix}$$

and a *lower Hessenberg matrix* is of the form

$$\begin{bmatrix} a_{11} & a_{12} & 0 & \cdots & 0 & 0 \\ a_{21} & a_{22} & a_{23} & \cdots & 0 & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ a_{n-2,1} & a_{n-2,2} & a_{n-2,3} & \cdots & a_{n-2,n-1} & 0 \\ a_{n-1,1} & a_{n-1,2} & a_{n-1,3} & \cdots & a_{n-1,n-1} & a_{n-1,n} \\ a_{n,1} & a_{n,2} & a_{n,3} & \cdots & a_{n,n-1} & a_{n,n} \end{bmatrix}$$