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The Hankel matrix rank theorem revisited

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ABSTRACT

We give a new short proof of a version of a Hankel matrix rank theorem. That version expresses the rank of H by the smallest possible rank of an infinite Hankel matrix containing H. The new approach is based on application of the Kronecker theorem.

A Hankel matrix is a rectangular matrix of form

$$H = \begin{pmatrix} s_1 & s_2 & s_3 & \dots & s_q \\ s_2 & s_3 & s_4 & \dots & s_{q+1} \\ s_3 & s_4 & s_5 & \dots & s_{q+2} \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ s_p & s_{p+1} & s_{p+2} & \dots & s_l \end{pmatrix} \quad (l = p + q - 1). \tag{1}$$

Thus, a Hankel matrix is characterized by the property that the (i, j) entry depends only on the sum $i + j$. Infinite Hankel matrices

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