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Essentials of Padé approximants, by George A. Baker, Jr., Academic Press, New York, 1975, xi+306 pp., $26.00.

The area of rational approximation and interpolation of functions has been studied intensively since the advent of electronic computers. This has brought the Padé table to the foreground and the text under review is the first pulling together of a lot of information about these tables that has appeared in the last 20 years. The texts by Perron and Wall on continued fractions, each of which devotes a chapter to the Padé table, have been among the chief references so far. A rational function $r_{m,n}(z)=p_{m,n}(z)/q_{m,n}(z)$ is of type (m, n) if $p_{m,n}(z)$ is a polynomial of degree $\leqq m$ and $q_{m,n}(z)$ a polynomial of degree $\leqq n$. $r_{m,n}(z)$ interpolates a given function $f(z)$ at the distinct points $z_1, \cdots, z_k$ if $r_{m,n}(z_i)=f(z_i)$, $i=1, \cdots, k$. If some of the points z_i coincide, say $z_1=z_2=z_3$, then it is natural to require $r_{m,n}(z_1)=f(z_1)$, $r'_{m,n}(z_1)=f'(z_1)$, and $r''_{m,n}(z_1)=f''(z_1)$ instead of $r_{m,n}(z_i)=f(z_i)$ for $i=1, 2, 3$. The case $z_1=z_2=\cdots=z_k$, i.e. $r^{(i)}_{m,n}(z_1)=f^{(i)}(z_1)$, for $i=0, 1, \ldots, k-1$ requires that $r_{m,n}(z)$ has a high order of contact with $f(z)$ at z_1. There are two classical and equivalent definitions of the (m, n) Padé approximant $R_{m,n}$ to $f(z)$ at $z=0$:

1. find the unique rational function $R_{m,n}$ in lowest terms such that $f(z)-R_{m,n}(z)=O(z^k)$, $k=$maximum, and
2. find polynomials $P_{m,n}$ and $Q_{m,n}$ such that $Q_{m,n}(z)f(z)-P_{m,n}(z)=O(z^{m+n+1})$, and let $R_{m,n}$ be $P_{m,n}/Q_{m,n}$ in lowest terms.

In definition 1, $R_{m,n}$ depends on $m+n+1$ parameters and one would