READER REFLECTIONS

We appreciate the interest and value the views of those who write. Readers commenting on articles are encouraged to send copies of their correspondence to the authors. For publication: All letters for publication are acknowledged, but because of the large number submitted, we do not send letters of acceptance or rejection. Please **TYPE AND DOUBLE-SPACE** *all letters to be considered for publication. Letters should not exceed 250 words and are subject to abridgement. At the end of the letter, include your name and affiliation, if any, including zip or postal code and e-mail address, in the style of the section.*

New back-to-school issue

Look for the first August issue of the *Mathematics Teacher,* which will be coming to you in late July. This shift in journal schedule meets the needs of increasing numbers of teachers who return to the classroom in early August. The journal will be there while you plan your school year. Since the December and January issues will be combined, you will continue to receive nine issues of the *Mathematics Teacher* each year.

Long division to synthetic division

Using synthetic division allows us to easily find the quotient and remainder when we divide a polynomial by a linear divisor $x - a$. Naturally, we can ask where the synthetic division comes from. What is the relationship between it and long division? We use an example to explain how synthetic division evolved from long division. In the example, we find the quotient $Q(x)$ and the remainder r, if we divide $2x^4 - 5x^3 - 7x^2 + 10x + 14$ by $x - 3$, as shown in **figure 1 (Feng).**

In the last representation, we only perform multiplication and addition. The quotient $Q(x)$ is $2x^3 + x^2 - 4x - 2$, and the remainder r is 8. The process illustrates why the division is called *synthetic.*

Bao Qi Feng
bfeng@tusc.kent.edu
Kent State University
New Philadelphia, OH 44663

$$\begin{array}{r} 2x^3+1x^2-4x-2 \\ 1x-3\;\big)\;\overline{2x^4-5x^3-7x^2+10x+14} \\ \underline{2x^4-6x^3} \\ \underline{\begin{array}{r}+1x^3-7x^2 \\ +1x^3-3x^2\end{array}} \\ \underline{\begin{array}{r}-4x^2+10x \\ -4x^2+12x\end{array}} \\ \underline{\begin{array}{r}-2x+14 \\ -2x+6\end{array}} \\ 8 \end{array} \quad \xrightarrow[\textit{all } x's]{\textit{Eliminate}} \quad \begin{array}{r} 2+1-4-2 \\ 1-3\;\big)\;\overline{2-5-7+10+14} \\ \underline{2-6} \\ \underline{\begin{array}{r}+1-7 \\ +1-3\end{array}} \\ \underline{\begin{array}{r}-4+10 \\ -4+12\end{array}} \\ \underline{\begin{array}{r}-2+14 \\ -2+6\end{array}} \\ 8 \end{array}$$

$$\xrightarrow[\textit{all repeat terms}]{\textit{Eliminate}} \quad \begin{array}{r} 2+1-4-2 \\ 1-3\;\big)\;\overline{2-5-7+10+14} \\ \underline{-6} \\ +1 \\ \underline{-3} \\ -4 \\ \underline{+12} \\ -2 \\ \underline{+6} \\ 8 \end{array} \quad \xrightarrow[\textit{vertically}]{\textit{Shrink}} \quad \begin{array}{r} 2+1-4-2 \\ 1-3\;\big)\;\overline{2-5-7+10+14} \\ \underline{-6-3+12+6} \\ +1-4-2+8 \end{array}$$

$$\xrightarrow[\textit{from } 2^{nd} \textit{ to } 4^{th} \textit{ row}]{\textit{Bring down the 2}} \quad \begin{array}{r} 2+1-4-2 \\ 1-3\;\big)\;\overline{2-5-7+10+14} \\ \underline{-6-3+12+6} \\ 2+1-4-2+8 \end{array} \quad \xrightarrow[\textit{the } 1^{st} \textit{ row and the top line}]{\textit{Erase}} \quad \begin{array}{r} 1-3\;\big)\;2-5-7+10+14 \\ \underline{-6-3+12+6} \\ 2+1-4-2+8 \end{array}$$

$$\xrightarrow[\textit{erase the number 1}]{\textit{In the divisor}} \quad \begin{array}{r} -3\;\big)\;2-5-7+10+14 \\ \underline{-6-3+12+6} \\ 2+1-4-2+8 \end{array} \quad \xrightarrow[\textit{replace } -3 \textit{ by } 3]{\textit{In the divisor}} \quad \begin{array}{r|r} 3 & 2-5-7+10+14 \\ & +6+3-12-6 \\ \hline & 2+1-4-2+8 \end{array}$$

Fig. 1 (Feng)