

Mar. 19, 2018

Sect. 6-7b

Synthetic Division

Remainder Theorem

Limitations

$$(x^2 + 5x + 6) \div (x + 2)$$

Handwritten long division showing the division of $x^2 + 5x + 6$ by $x + 2$. The divisor is $x + 2$, and the dividend is $x^2 + 5x + 6$. The quotient is $x + 3$. The remainder is 0. The work is shown as follows:

$$\begin{array}{r} -2 \overline{) 1 \ 5 \ 6} \\ \underline{1 \ 2} \\ 3 \\ \underline{3 \ 0} \\ 0 \end{array}$$

$$1x + 3 = x + 3$$

$$(3x^3 - 7x^2 + 9x - 14) \div (x - 2)$$

$$\begin{array}{r|rrrr} \underline{2} & 3 & -7 & 9 & -14 \\ & \downarrow & 6 & -2 & 14 \\ \hline & 3 & -1 & 7 & 0 \\ & 3x^2 & -1x & +7 & \end{array}$$

$$(2x^3 + 2x^2 - 7) \div (x + 3)$$

$$\begin{array}{r|rrrr}
 -3 & 2 & 2 & 0 & -7 \\
 & + \downarrow & -6 & 12 & -36 \\
 \hline
 & 2 & -4 & 12 & -43
 \end{array}$$

$$2x^2 - 4x + 12 + \frac{-43}{x+3}$$

$$(3x^4 + 2x^2 - 1) \div (x - 2)$$

$$\begin{array}{r|rrrrr} 2 & 3 & 0 & 2 & 0 & -1 \\ & +\downarrow & & & & \\ & & 6 & 12 & 28 & 56 \\ \hline & & 3 & 6 & 14 & 28 & 55 \end{array}$$

$$3x^3 + 6x^2 + 14x + 28 + \frac{55}{x-2}$$

$$f(x) = 3x^4 + 2x^2 - 1$$

Find $f(2)$

$$\begin{aligned} f(2) &= 3(2)^4 + 2(2)^2 - 1 \\ &= 3(16) + 2(4) - 1 \\ &= 48 + 8 - 1 \\ &= 56 - 1 \\ &= 55 \end{aligned}$$

The answer for $f(z)$
is the same as when
we run z through synth.

This is called the
Remainder Theorem

Limitations

$$\frac{(2x^2 + 5x - 6)}{2} \div \frac{(2x + 1)}{2}$$

$$\left(x^2 + \frac{5}{2}x - 3\right) \div \left(x + \frac{1}{2}\right)$$

$$\begin{array}{r|l} -\frac{1}{2} \downarrow & \begin{array}{r} 1 \\ + \downarrow \\ 1 \end{array} \quad \begin{array}{r} \text{NS} \\ -\frac{1}{2} \\ 2 \end{array} & \begin{array}{r} -3 \\ -1 \\ -4 \end{array} \end{array}$$

$$x + 2 + \frac{-4}{x + \frac{1}{2}} = x + 2 + \frac{-8}{2x + 1}$$

$$(x^3 + 2x^2 - 3x + 1) \div (x^2 - 1)$$

Can't do with synthetic.

Must use long division.