

Exercise 16

For the following exercises, use synthetic division to find the quotient.

$$(6x^3 - 10x^2 - 7x - 15) \div (x + 1)$$

Solution

Solving $x + 1 = 0$ gives $x = -1$; this is the number that goes on the top left. Write out all the coefficients of the dividend to the right.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ \hline & & & & \end{array}$$

Bring down the leading coefficient.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ \hline & 6 & & & \end{array}$$

Multiply the top left number by the number brought down and put the result under the second coefficient of the dividend.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ \hline & 6 & -6 & & \end{array}$$

Add the numbers in the second column.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ & & -6 & & \\ \hline & 6 & -16 & & \end{array}$$

Multiply this sum of the second column by the top left number and put it in the next column.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ & & -6 & 16 & \\ \hline & 6 & -16 & & \end{array}$$

Add the numbers in the third column.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ & & -6 & 16 & \\ \hline & 6 & -16 & 9 & \end{array}$$

Multiply this sum of the third column by the top left number and put it in the next column.

$$\begin{array}{r|rrrr} -1 & 6 & -10 & -7 & -15 \\ & & -6 & 16 & -9 \\ \hline & 6 & -16 & 9 & \end{array}$$

Add the numbers in the fourth column.

$$\begin{array}{r|rrrr|r} -1 & 6 & -10 & -7 & -15 \\ & & -6 & 16 & -9 \\ \hline & 6 & -16 & 9 & -24 \end{array}$$

This final result is the remainder, and the numbers to the left are the coefficients of the quotient, which is $6x^2 - 16x + 9$.

$$(6x^3 - 10x^2 - 7x - 15) \div (x + 1) = 6x^2 - 16x + 9 + \frac{-24}{x + 1}$$