

Exercise 15

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

$$(2x^3 - 6x^2 - 7x + 6) \div (x - 4)$$

Solution

Solving $x - 4 = 0$ gives $x = 4$; this is the number that goes on the top left. Write out all the coefficients of the dividend to the right.

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ \hline & & & & \end{array}$$

Bring down the leading coefficient.

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ \hline & 2 & & & \end{array}$$

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

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ \hline & 2 & 8 & & \end{array}$$

Add the numbers in the second column.

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ & & 8 & & \\ \hline & 2 & 2 & & \end{array}$$

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

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ & & 8 & 8 & \\ \hline & 2 & 2 & & \end{array}$$

Add the numbers in the third column.

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ & & 8 & 8 & \\ \hline & 2 & 2 & 1 & \end{array}$$

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

$$\begin{array}{r|rrrr} 4 & 2 & -6 & -7 & 6 \\ & & 8 & 8 & 4 \\ \hline & 2 & 2 & 1 & \end{array}$$

Add the numbers in the fourth column.

$$\begin{array}{r|rrrr|r} 4 & 2 & -6 & -7 & 6 \\ & & 8 & 8 & 4 \\ \hline & 2 & 2 & 1 & 10 \end{array}$$

This final result is the remainder, and the numbers to the left are the coefficients of the quotient, which is $2x^2 + 2x + 1$.

$$(3x^3 - 2x^2 + x - 4) \div (x + 3) = 2x^2 + 2x + 1 + \frac{10}{x + 3}$$