

Exercise 24

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

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

Solution

Solving $x + 2 = 0$ gives $x = -2$; this is the number that goes on the top left. Write out all the coefficients of the dividend to the right.

$$\begin{array}{r|rrrr} -2 & 1 & 0 & -3 & 2 \\ \hline & & & & \end{array}$$

Bring down the leading coefficient.

$$\begin{array}{r|rrrr} -2 & 1 & 0 & -3 & 2 \\ \hline & 1 & & & \end{array}$$

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

$$\begin{array}{r|rrrr} -2 & 1 & 0 & -3 & 2 \\ \hline & 1 & -2 & & \end{array}$$

Add the numbers in the second column.

$$\begin{array}{c|cccc} -2 & 1 & 0 & -3 & 2 \\ \hline & & -2 & & \\ \hline & 1 & -2 & & \end{array}$$

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

$$\begin{array}{c|cccc} -2 & 1 & 0 & -3 & 2 \\ \hline & & -2 & 4 & \\ \hline & 1 & -2 & & \end{array}$$

Add the numbers in the third column.

$$\begin{array}{c|cccc} -2 & 1 & 0 & -3 & 2 \\ \hline & & -2 & 4 & \\ \hline & 1 & -2 & 1 & \end{array}$$

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

$$\begin{array}{r|rrrr} -2 & 1 & 0 & -3 & 2 \\ & & -2 & 4 & -2 \\ \hline & 1 & -2 & 1 & \end{array}$$

Add the numbers in the fourth column.

$$\begin{array}{r|rrrr|c} -2 & 1 & 0 & -3 & 2 \\ & & -2 & 4 & -2 \\ \hline & 1 & -2 & 1 & 0 \end{array}$$

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

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