

## Exercise 8

For the following exercises, use long division to divide. Specify the quotient and the remainder.

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

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### Solution

Set up the division problem, writing out every term in the dividend.

$$x + 1 \overline{) -x^2 + 0x - 1}$$

Divide the leading term of the dividend by the leading term of the divisor and place the result above the term with the same power of  $x$ .

$$x + 1 \overline{) -x^2 + 0x - 1} \quad \begin{array}{r} -x \\ \hline \end{array}$$

Multiply this result by the divisor and subtract it from the dividend.

$$x + 1 \overline{) -x^2 + 0x - 1} \quad \begin{array}{r} -x \\ \hline -(-x^2 - x) \\ \hline x \end{array}$$

Bring the next term in the dividend down.

$$\begin{array}{r} \phantom{x+1} \overline{-x} \\ x+1 \overline{) -x^2 + 0x - 1} \\ \underline{-(-x^2 - x)} \phantom{-1} \downarrow \\ \phantom{x+1} \overline{x - 1} \end{array}$$

Divide the leading term of this modified dividend by the leading term of the divisor and place the result above the term with the same power of  $x$ .

$$\begin{array}{r} \phantom{x+1} \overline{-x + 1} \\ x+1 \overline{) -x^2 + 0x - 1} \\ \underline{-(-x^2 - x)} \phantom{-1} \\ \phantom{x+1} \overline{x - 1} \end{array}$$

Multiply this result by the divisor and subtract it from the modified dividend.

$$\begin{array}{r} \phantom{x+1} \overline{-x + 1} \\ x+1 \overline{) -x^2 + 0x - 1} \\ \underline{-(-x^2 - x)} \phantom{-1} \\ \phantom{x+1} \overline{x - 1} \\ \phantom{x+1} \underline{-(x + 1)} \\ \phantom{x+1} \overline{-2} \end{array}$$

There are no further terms in the dividend to drop down, so the division is complete. The quotient is  $-x + 1$ , and the remainder is  $-2$ .

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