Exercise 6

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

$$(4x^2 - 10x + 6) \div (4x + 2)$$

Solution

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

$$4x + 2 \overline{)\, 4x^2 - 10x + 6}$$

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.

$$\begin{array}{r} x \\ 4x + 2 \overline{)\, 4x^2 - 10x + 6} \end{array}$$

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

$$\begin{array}{r} x \\ 4x + 2 \overline{)\, 4x^2 - 10x + 6} \\ -\left(4x^2 + 2x\right) \\ \hline -12x \end{array}$$

Bring the next term in the dividend down.

$$\begin{array}{r} x \\ 4x+2\overline{)\,4x^2-10x+6} \\ \underline{-\left(4x^2+2x\right)\ \downarrow} \\ -12x+6 \end{array}$$

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.

$$\begin{array}{r} x-3 \\ 4x+2\overline{)\,4x^2-10x+6} \\ \underline{-\left(4x^2+2x\right)} \\ -12x+6 \end{array}$$

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

$$\begin{array}{r} x-3 \\ 4x+2\overline{)\,4x^2-10x+6} \\ \underline{-\left(4x^2+2x\right)} \\ -12x+6 \\ \underline{-(-12x-6)} \\ 12 \end{array}$$

There are no further terms in the dividend to drop down, so the division is complete. The quotient is $x-3$, and the remainder is 12.

$$\begin{aligned} (4x^2-10x+6)\div(4x+2) &= x-3+\frac{12}{4x+2} \\ &= x-3+\frac{6}{2x+1} \end{aligned}$$