Divide a polynomial by a monomial

Remember that terms are things separated by pluses and minuses.

p. 268  Ex 1 a)

\[
\frac{4x + 20}{4} = \frac{4x}{4} + \frac{20}{4} = x + 5
\]

What the book is not saying is that these are just distributive problems with division (instead of multiplication). The distributive problems up until now have all used multiplication. Look at the above problem again in a slightly different way.

\[
\frac{4x + 20}{4} \quad \text{would be the answer to a multiplication of fractions problem if the 2 fractions looked like this before multiplying:}
\]

\[
\frac{1}{4} \times \frac{4x + 20}{1} \quad \leftarrow \text{This could be rewritten by dropping the 1 in the bottom.}
\]

\[
\frac{1}{4} (4x + 20) = \frac{1}{4} (4x) + \frac{1}{4} (20) = \frac{1}{4} \times 4x + \frac{1}{4} \times 20 = x + 5
\]

This is the same answer as above.
p. 268 Ex 1 b) \[
\frac{9x^2 - 6x}{3x} = \]
3x is divided into both terms
\[
\frac{9x^2}{3x} - \frac{6x}{3x} = \]
Use the rules from Sections 4.1 and 4.2 to simplify.
\[
3x - 2 \]

p. 268 Ex 2 \[
\frac{4t^5 - 6t^4 + 8t - 3}{2t^2} = \]
2t^2 is divided into each of the 4 terms
\[
\frac{4t^5}{2t^2} - \frac{6t^4}{2t^2} + \frac{8t}{2t^2} - \frac{3}{2t^2} = \]
\[
2t^3 - 3t^2 + \frac{4}{t} - \frac{3}{2t^2} \]

This is actually a poor example because the answer is not a polynomial. The 3rd and 4th terms \((\frac{4}{t} \text{ and } -\frac{3}{2t^2})\) have negative exponents which means "no polynomial". There will be no more problems like this after this section.

REMEMBER -

Canceling only happens with all multiplication. So the problem CANNOT be done like this:
\[
\frac{4t^5 - 6t^4 + 8t - 3}{2t^2} \]
\[
\frac{2t^3}{1} \]

The pluses and minuses in the top STOP any canceling.

This is just like the clearing of fractions problems. There is canceling or there is distributing with fractions. You have to decide which it is. CANCELING ONLY HAPPENS WITH ALL MULTIPLICATION.
Look at example (b) again

\[
\frac{9x^2 - 6x}{3x} = \quad 3x \text{ cannot be canceled with } 9x^2 \text{ or } -6x \text{ because of the subtraction sign between the 2 terms.}
\]

\[
\frac{9x^2}{3x} - \frac{6x}{3x} = \quad \text{Distribute the } 3x
\]

Now the canceling can happen

The term \(\frac{9x^2}{3x}\) has all multiplication in the top and bottom.

The term \(-\frac{6x}{3x}\) has all multiplication in the top and bottom.

\[
\frac{9x^2}{3x} - \frac{6x}{3x} = \quad \text{Canceling happens when there's all multiplication.}
\]

\[
3x - 2
\]