Divide:

a)

$$x^2 - 2x - 3$$

$$2x+1 \overline{\smash{)}\,2x^3 - 3x^2 - 8x - 3}$$

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

$$0x^3 - 4x^2 - 8x$$

$$-(-4x^2 - 2x)$$

$$-6x - 3$$

$$-(-6x - 3)$$

$$0$$

$$\underline{\underline{x^2 - 2x - 3}}$$

b)

$$x^2 + 5x + 6$$

$$x-2 \overline{\smash{)}\,x^3 + 3x^2 - 4x - 12}$$

$$-(x^3 - 2x^2)$$

$$5x^2 - 4x$$

$$-(5x^2 - 10x)$$

$$6x - 12$$

$$-(6x - 12)$$

$$0$$

$$\underline{\underline{x^2 + 5x + 6}}$$

Example: Is $x+2$ a factor of $3x^3+10x^2+x-14$?

$\frac{3x^3}{x^1}$

To find out, divide...

$$
\begin{array}{r}
3x^2+4x-7 \\
x+2\overline{\big)\,3x^3+10x^2+x-14} \\
-(3x^3+6x^2) \qquad\qquad \\
\hline
4x^2+x \qquad \\
-(4x^2+8x) \qquad \\
\hline
-7x-14 \\
-(-7x-14) \\
\hline
0
\end{array}
$$

$\frac{4x^2}{x}=?$

If the remainder is 0,

it is a factor.

$-\frac{7x}{x}=?$

R = 0

yes, it's a factor

Example: Is $(x+2)$ a factor of $3x^4-6x^2+5x-8$?

$$
\begin{array}{r}
3x^3 - 6x^2 + 6x - 7 \\
x+2 \,\big)\overline{\, \underline{3x^4} + \underline{\underline{0x^3}} - 6x^2 + 5x - 8} \\
-\left(3x^4 + 6x^3\right) \\
\hline
-6x^3 - 6x^2 \\
-\left(-6x^3 - 12x^2\right) \\
\hline
6x^2 + 5x \\
-\left(6x^2 + 12x\right) \\
\hline
-7x - 8 \\
-\left(-7x - 14\right) \\
\hline
6
\end{array}
$$

R = 6

No, not a factor

Example: $(x^3-28x-41)\div(x+4)$

$$\begin{array}{r|l} & x^2-4x-12 \\ \hline x+4 & x^3+0x^2-28x-41 \\ & -(x^3+4x^2) \\ \hline & \quad -4x^2-28x \\ & \quad -(-4x^2-16x) \\ \hline & \qquad -12x-41 \\ & \qquad -(-12x-48) \\ \hline & \qquad\qquad 7 \end{array}$$

$$x^2-4x-12+\frac{7}{x+4}$$

Work Book, Page 13, Question 3 d, e, f

Example: What is the remainder of the following polynomial division?

$$x-3\overline{)x^3+3x^2+8}$$

$$\begin{array}{r}
x^2+6x+18 \\
x-3\overline{)x^3+3x^2+0x+8} \\
-(x^3-3x^2) \\
\hline
6x^2+0x \\
-(6x^2-18x) \\
\hline
18x+8 \\
-(18x-54) \\
\hline
62
\end{array}$$

Remainder
is
62

Example: $\left(x^4+x^3+7x^2-6x+8\right)\div\left(x^2+2x+8\right)$

$$\begin{array}{r} x^2 - x + 1 \\ \underline{\underline{x}}^2+2x+8\,\overline{\smash{)}\,x^4+x^3+7x^2-6x+8} \\ -(\underline{\underline{x}}^4+2x^3+8x^2) \\ \hline -x^3-x^2-6x \\ -(-x^3-2x^2-8x) \\ \hline x^2+2x+8 \\ -(x^2+2x+8) \\ \hline 0 \end{array}$$