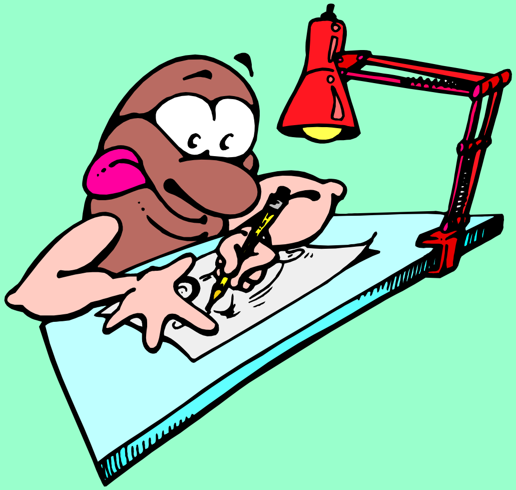


2.

Division by (x-a)

A numerical example of division

Lets divide 317 by 13:

$$\begin{array}{r} 2\ \ 4 \\ 13\overline{\smash{)}317} \\ \underline{26\ \downarrow} \\ 5\ 7 \\ \underline{5\ 2} \\ 5 \end{array}$$

So $317 = (13 \times 24) + 5 \leftarrow$ **Remainder**

Dividend

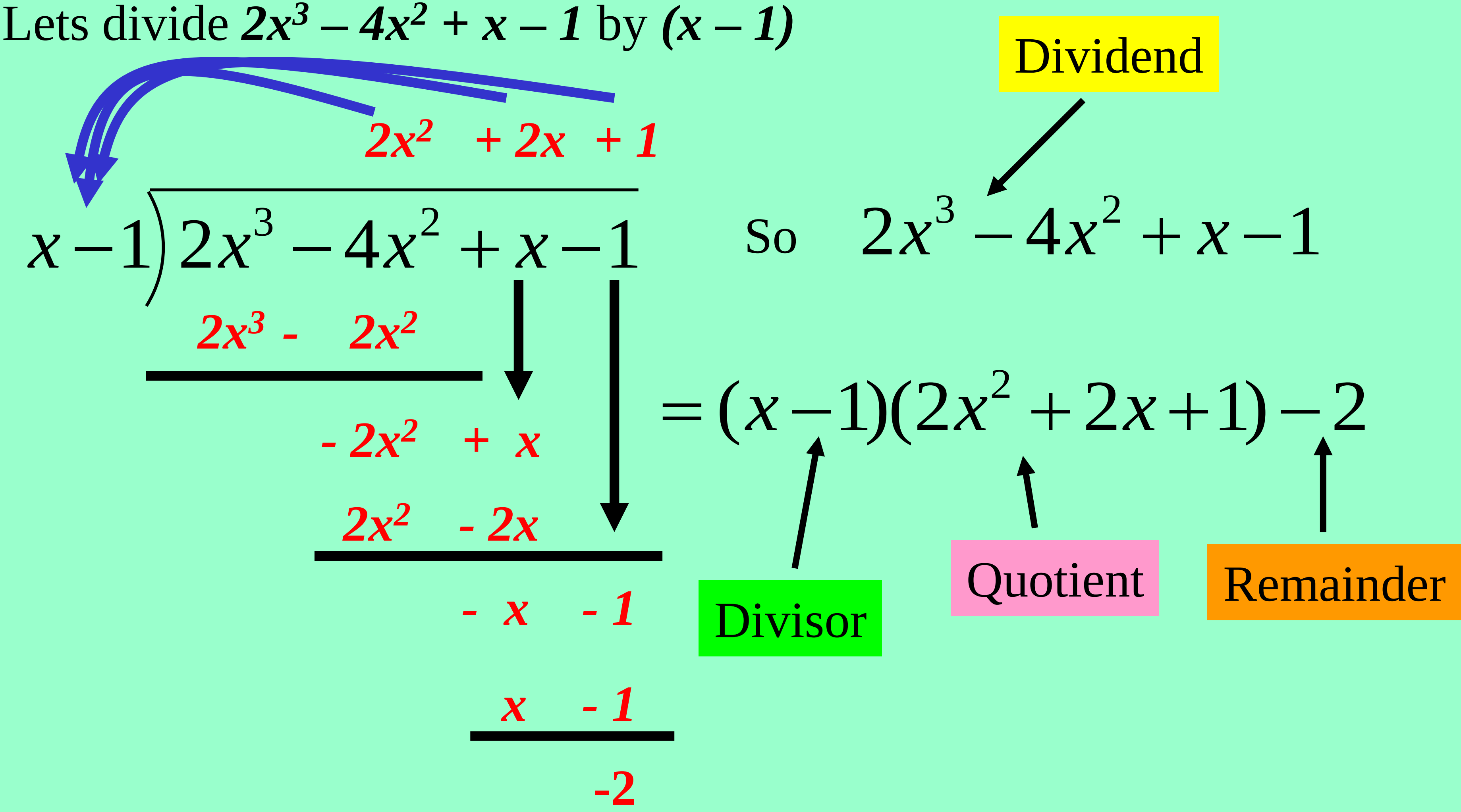
Quotient

Divisor

This can be written as: f(x) = (x – h) x Q(x) + R

An example of algebraic division

Lets divide $2x^3 – 4x^2 + x – 1$ by $(x – 1)$



$$\begin{array}{r} 2x^2 \quad + 2x \quad + 1 \\ x-1 \overline{\big) 2x^3 - 4x^2 + x - 1} \\ 2x^3 - \quad 2x^2 \qquad\qquad \\ \hline - 2x^2 \quad + x \quad \\ 2x^2 \quad - 2x \quad \\ \hline - x \quad - 1 \\ x \quad - 1 \\ \hline -2 \end{array}$$

Dividend

So $2x^3 - 4x^2 + x - 1$

$$= (x-1)(2x^2 + 2x + 1) - 2$$

Divisor

Quotient

Remainder

Once again this can be written as: f(x) = (x – h) x Q(x) + R

Example 1

Divide $2x^3 – 4x^2 + x – 1$ by $(x - 1)$, expressing your answer in the form $f(x) = (x – h) Q(x) + R$.

Solution:

$x - 1 = 0$

$x = 1$

	x^3	x^2	x	x^0
$x = 1$	2	-4	1	-1
		2	-2	-1
	2	-2	-1	-2

As we divided by (x – 1) all powers reduce by 1

Divisor $(x – 1)$

Remainder -2

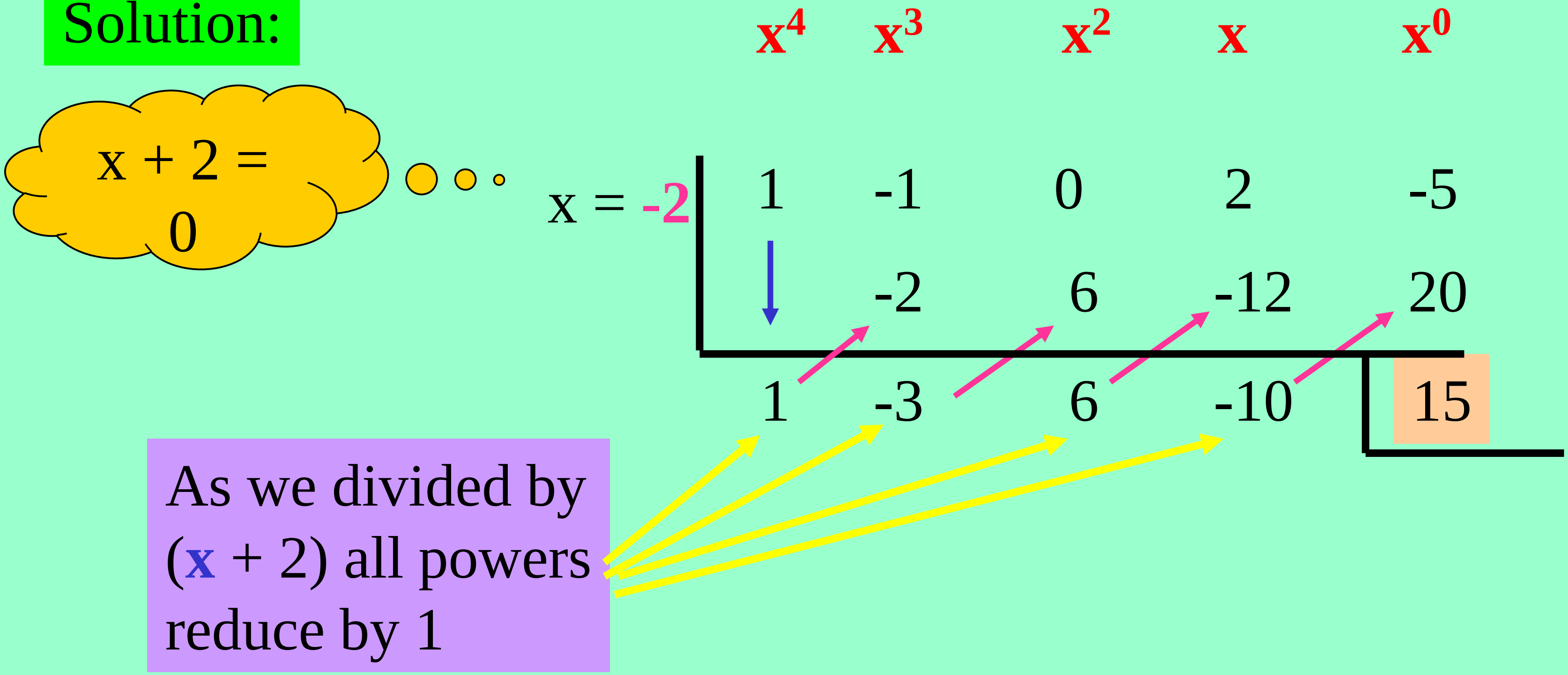
Quotient $2x^2 - 2x - 1$

So $f(x) = (x-1)(2x^2 - 2x - 1) - 2$

Example 2

Divide $x^4 - x^3 + 2x - 5$ by $(x + 2)$, expressing your answer in the form $f(x) = (x - h) Q(x) + R$.

Solution:



$x + 2 = 0$

	x^4	x^3	x^2	x	x^0
$x = -2$	1	-1	0	2	-5
		-2	6	-12	20
	1	-3	6	-10	15

As we divided by (**x** + 2) all powers reduce by 1

$$\text{So } f(x) = (x + 2)(x^3 - 3x^2 + 6x - 10) + 15$$

Heinemann, p.129, EX 7C, Q2 & 3

p.130, Ex 7D, Q1 to 4