Long Division

Remember 4th grade? You learned LONG DIVISION!!! We're using it again :-)

Numerical long division and polynomial long division are similar.

Numerical Long Division		Polynomial Long Division	
$\begin{array}{r} 32 \\ 21\overline{)672} \\ \underline{63} \\ 42 \\ \underline{42} \\ 0 \end{array}$	21 divides into 67 3 times 21 divides into 42 2 times	$\begin{array}{r} 3x+2 \\ 2x+1\overline{)6x^2+7x+2} \\ \underline{6x^2+3x} \\ 4x+2 \\ \underline{4x+2} \\ 0 \end{array}$	$(2x+1)$ divides into $(6x^2+7x)$ $3x$ times $(2x+1)$ divides into $(4x+2)$ 2 times

The remainder from each division above is 0, so 21 is a factor of 672 and $2x + 1$ is a factor of $6x^2 + 7x + 2$.

Long Division

Ex. 1 $(x^2-3x+2)\div(x-1)$

$x-2$

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

subtract $\rightarrow -x^2+x$

$-2x+2$

subtract $\rightarrow -(-2x+2)$

0

$x-2$

Ex. 2 $(5x^3 + x^2 - x + 3) \div (x + 1)$

$5x^2 - 4x + 3$

$x+1 \overline{)\ 5x^3 + x^2 - x + 3}$

subtract → $-5x^3 + 5x^2$

$-4x^2 - x$

subtract → $+4x^2 + 4x$

$+3x + 3$

subtract → $-3x + 3$

0

$5x^2 - 4x + 3$

Ex. 3 put in standard form

$(10x - 5x^2 + x^3 - 24) \div (x^2 - x + 6)$

$x - 4$

$x^2 - x + 6 \overline{)\ x^3 - 5x^2 + 10x - 24}$

$-x^3 + x^2 + -6x$

$-4x^2 + 4x - 24$

$+4x^2 + -4x + 24$

0

$x - 4$

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

standard form with place holder x^2+0x-6

$$x+4 \overline{)\, x^2+0x-6}$$

$x-4$

$-x^2+4x$

$-4x-6$

$+4x+16$

10 remainder

So $x-4+\frac{10}{x+4}$