AA

Synthetic Division

* only works with binomials ($x+7$, $2x-1$ ...)

Ex 1 $x^4-10x^2-2x+4 \div x+3$

the set up — coefficients & placeholders

$x+3=0$
$x=-3$ → the root

-3	1	0	-10	-2	4
drop		-3	9	3	-3
	1	-3	-1	1	1 ← remainder

$$x^3-3x^2-x+1+\frac{1}{x+3}$$

Ex 2 $3x^3-2x^2+3x-4 \div x-3$

3	3	-2	3	-4
	↓	9	21	72
	3	7	24	68

$$3x^2+7x+24+\frac{68}{x-3}$$

→

fully factor

use S.D. to prove x is a factor then fully factor

ex3 $x^3-39x+70$, $x=5$

$$\begin{array}{c|ccc} 5 & 1 & 0 & -39 & 70 \\ & \downarrow & 5 & 25 & -70 \\ \hline & 1 & 5 & -14 & \boxed{0} \end{array}$$

✓ yes it's a factor R=0

$x^2+5x-14 = (x+7)(x-2)$

$$\boxed{(x-5)(x+7)(x-2)}$$
$$x=5,-7,2$$

original root

ex4 $(2x^3+17x^2+27x-18)$, $x=-6$

$$\begin{array}{c|cccc} -6 & 2 & 17 & 27 & -18 \\ & \downarrow & -12 & -30 & 18 \\ \hline & 2 & 5 & -3 & \boxed{0} \end{array}$$

$2x^2+5x-3 = (2x-1)(x+3)$

$$\boxed{(x+6)(2x-1)(x+3)}$$
$$x=-6, \tfrac{1}{2}, -3$$