

R.6 Synthetic Division

* can only use synthetic division when a polynomial is being divided by $x-c$.

ex. 1) $(x^3 - 4x^2 - 5) \div (x-3)$ $\xrightarrow{x=3}$

↑
rewrite
 $x^3 - 4x^2 + 0x - 5$

3	1	-4	0	-5
	↓ 3	-3	-9	
	1	-1	-3	(-14) ← remainder

answer: $x^2 - x - 3 - \frac{14}{x-3}$

ex. 2) $2x^5 + 5x^4 - 2x^3 + 2x^2 - 2x + 3 \leftarrow$ dividend
 $x+3 \leftarrow$ divisor

-3	2	5	-2	2	-2	3
	↓ -6	3	-3	3	-3	
	2	-1	1	-1	1	(0) remainder

answer: $2x^4 - x^3 + x^2 - x + 1$

How can we check our answer??

$$(\text{Divisor}) \cdot (\text{Quotient}) + \text{Remainder} = (\text{equals}) \text{Dividend}$$

ex. 1 check) $(x-3) \cdot (x^2 - x - 3) + (-14)$
 $= (x^3 - x^2 - 3x - 3x^2 + 3x + 9) + (-14)$
 $= x^3 - 4x^2 - 5 = \text{Dividend} \checkmark$