6.3 Synthetic Division

Shorthand method of dividing a polynomial by a linear binomial

- polynomial must be in standard form, using 0 as a coefficient for any missing terms
- divisor must be in the form $(x-a)$

example 1

$(2x^2+7x+9) \div (x+2)$

① Write the coefficients of the dividend. In the upper left corner, write the value of a. Drop the first coefficient.

② Multiply the first coefficient by the divisor & write the product under the next coefficient. Add numbers in the column.

③ Draw box around last sum. This is the remainder.

④ Remaining numbers are coefficient of answer.

-2	2	7	9
	↓	-4	-6
	2	3	**3**

$2x+3+\frac{3}{x+2}$

example 2

$(4x^2-12x+9) \div (x+\frac{1}{2}) = 4x-14+\frac{16}{x+\frac{1}{2}}$

$-\frac{1}{2}$	4	-12	9
	↓	-2	7
	4	-14	**16**

example 3

$(x^4-2x^3+3x+1) \div (x-3) = x^3+x^2+3x+12+\frac{37}{x-3}$

3	1	-2	0	3	1
		↓	3	3	9	36
	1	1	3	12	**37**