

Powered Continued Fraction:

An expression of form

$$\left[a_1 + \frac{b_1}{\left[a_2 + \frac{b_2}{\left[a_3 + \frac{b_3}{a_4} \right]^{k_3}} \right]^{k_2}} \right]^{k_1}$$

a_i, b_i and k_i are rationals

and $a_i \neq 0$ (for ease)

For example

$$\left[1 + \frac{1}{\left[1 + \frac{1}{\left[1 + \frac{1}{1} \right]^1} \right]^2} \right]^3$$

which is difficult looking
but can be solved step-by-step
just like continued fraction.

It is a more general
form of a generalized continued
fraction.

Examples:

A simple cubic equation.

$$x^3 = x^2 + 4$$

Divide by 'x²' gives

$$x = 1 + \frac{4}{x^2}$$

replace 'x' on R.H.S by its value

$$x = 1 + \frac{4}{\left[1 + \frac{4}{x^2}\right]^2}$$

Continue this process till 'x' is eliminated from R.H.S
At the end

$$x = 1 + \frac{4}{\left[1 + \frac{4}{\left[1 + \frac{4}{\left[1 + \frac{4}{\downarrow}\right]^2}\right]^2}\right]^2}$$

↓ means To be continued.