Basic Forms of the Partial Fraction Decomposition (PFD)

I. When the denominator has the form:

(x – a) (x – b) (x – c) ··· (x – d) ← Distinct Linear Factors

Form: PFD $= \dfrac{A}{x-a} + \dfrac{B}{x-b} + \cdots + \dfrac{D}{x-d}$

II. When the denominator has the form:

$$(x-a)^k$$

Form: PFD $= \dfrac{A_1}{x-a} + \dfrac{A_2}{(x-a)^2} + \dfrac{A_3}{(x-a)^3} + \cdots + \dfrac{A_k}{(x-a)^k}$

III. When the denominator has distinct non-factorable non-repeated quadratic factors of the form $x^2 + bx + c$:

Form: Each such factor requires a term of the form: $\dfrac{Ax + B}{x^2 + bx + c}$

IV. When the denominator is a power of a non-factorable quadratic factor $(x^2 + bx + c)^k$:

Form: PFD $= \dfrac{A_1x + B_1}{x^2 + bx + c} + \dfrac{A_2x + B_2}{(x^2 + bx + c)^2} + \cdots + \dfrac{A_kx + B_k}{(x^2 + bx + c)^k}$

V. When the denominator factors completely into a combination of the above, these basic Forms string together to make the basic Form of the whole.