Partial Fractions

If *degree of numerator < degree of denominator*, then:

$$\frac{ax+b}{(px+q)(rx+s)} = \frac{A}{px+q} + \frac{B}{rx+s}$$

$$\frac{ax^2+bx+c}{(px+q)(rx+s)^2} = \frac{A}{px+q} + \frac{B}{rx+s} + \frac{C}{(rx+s)^2}$$

If *degree of numerator = degree of denominator*, then:

$$\frac{ax^2+bx+c}{(px+q)(rx+s)} = A + \frac{B}{px+q} + \frac{C}{rx+s}$$

$$\frac{ax^3+bx^2+cx+d}{(px+q)(rx+s)^2} = A + \frac{B}{px+q} + \frac{C}{rx+s} + \frac{D}{(rx+s)^2}$$

If *degree of numerator exceeds degree of denominator by 1*, then:

$$\frac{ax^3+bx^2+cx+d}{(px+q)(rx+s)} = Ax + B + \frac{C}{px+q} + \frac{D}{rx+s}$$

$$\frac{ax^4+bx^3+cx^2+dx+e}{(px+q)(rx+s)^2} = Ax + B + \frac{C}{px+q} + \frac{D}{rx+s} + \frac{E}{(rx+s)^2}$$

If *degree of numerator exceeds degree of denominator by 2*, then:

$$\frac{ax^4+bx^3+cx^2+dx+e}{(px+q)(rx+s)} = Ax^2 + Bx + C + \frac{D}{px+q} + \frac{E}{rx+s}$$

If *degree of numerator exceeds degree of denominator by 3*, then:

$$\frac{ax^5 + bx^4 + cx^3 + dx^2 + ex + f}{(px + q)(rx + s)} = Ax^3 + Bx^2 + Cx + D + \frac{E}{px + q} + \frac{F}{rx + s}$$

If *degree of numerator exceeds degree of denominator by n*, then:

$$\frac{ax^{m+n} + bx^{m+n-1} + \ldots + jx + k}{(px + q)(rx + s)} = Ax^n + Bx^{n-1} \ldots + I + \frac{J}{px + q} + \frac{K}{rx + s}$$

Further to this…

$$\frac{3x}{(x - 2)(x^2 + 4)} = \frac{A}{(x - 2)} + \frac{Bx + C}{(x^2 + 4)}$$

$$\frac{3x}{(x - 2)(x^3 + 4)} = \frac{A}{(x - 2)} + \frac{Bx^2 + Cx + d}{(x^3 + 4)}$$