Note on the paper, of Dr Bevan B. Baker, An Extension of Heaviside's Operational Method of Solving Differential Equations.*

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§ 1. Let f(x) and F(x) be polynomials which are supposed to be decomposed into a series of n terms as

Further let θ be a distributive operation and $\phi(x)$ be a given function. Then the functional equation

$$F(\theta) y(x) = f(\theta) \phi(x)$$

has a solution of the form

where $y_{\nu}(x)$ ($\nu = 1, 2, ..., n$) is the solution of the equation

$$F_r(\theta) y_r(x) = f_r(\theta) \phi(x) \dagger$$
$$(v = 1, 2, \dots n).$$

The equation (2) may be written symbolically as follows

$$\frac{f(\theta)}{F(\theta)}\phi(x) = \sum_{r=1}^{n} \frac{f_r(\theta)}{F_r(\theta)}\phi(x); \qquad (2')$$

and, by a special suitable choice of the decomposition (1) and of the functions ϕ , f, F, this last formula (2') leads to a series of results both in the differential and in the difference calculus.

součtů
$$S\phi(z) \nabla z$$
 a $\tilde{S} = \phi(z) \Delta z$, Casopis, 54, Praha (in the press).

^{*} Proc. Edinburgh Math. Soc., XLII (1924), 95-103.

⁺ The demonstration of the equation (2), with certain results belonging to the calculus of differences are given by the author in the paper, "O redukci

§2. For example let the degree of f(x) be less than the degree of F(x), and suppose that the decomposition (1) is into partial fractions. In this case the relation (2) yields

where $\frac{\phi(x)}{\theta-r}$ is the solution of the equation

$$(\theta - r) y(x) = \phi(x),$$

and S means the sum of residues of the function

$$rac{\phi(x)}{\theta-r}\cdotrac{f(r)}{F(r)}$$

with regard to the poles of F(r).

Further let

$$D=\frac{d}{dx}$$

and let us consider the solution of the equation

$$(D-r) y(x) = \phi(x)$$

for which y(0) = 0. In this case

$$y(x) = \int_0^x e^{r(x-z)} \phi(z) dz$$

and formula (3) gives

To simplify matters let us suppose that F(r) is of degree *n* and has only simple zeros r,. Then if we write

$$A_{\nu} = \frac{f(r_{\nu})}{F(r_{\nu})}$$

the equation (4) becomes

By proper choice of $\phi(x)$ in (5) the formulae of Bromwich, Carson, Heaviside and Baker may severally be deduced.

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