Intrafunctorial Calculus: An Example Solution

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1 Introduction

$\mathcal{G}_{\alpha+\delta,\kappa}\colon R \to R$ such that

$$\mathcal{G}_{\alpha+\delta,\kappa}(z) = \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\frac{\ln\left(\beta\Omega^{\alpha+\delta}\right)}{\kappa}\right].$$

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}(x^{f(\infty)};\zeta_x, m_x).$$

$\mathrm{G}_{\alpha+\delta,\kappa}(z) = \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\frac{\ln\left(\beta\Omega^{\alpha+\delta}\right)}{\kappa}\right]$
$= \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\frac{1}{\kappa}\ln\left(\beta\Omega^{\alpha+\delta e^{-\kappa z}}\right)\right]$
$= \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\frac{1}{\kappa}\ln\left(\beta\Omega\left(\Omega^{\delta e^{-\kappa z}}\right)^{\alpha}\right)\right]$
$= \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\frac{1}{\kappa}\ln\left(\beta\Omega\right) + \alpha\ln\left(\Omega^{\delta e^{-\kappa z}}\right)\right]$
$= \frac{\partial}{\partial x^{\alpha+\delta}} \tanh\left[\alpha\ln\left(\Omega^{\delta e^{-\kappa z}}\right)\right]$
$= \frac{\delta e^{-\kappa z}}{\Omega^{\delta e^{-\kappa z}}}\left[1-\tanh^2\left(\alpha\ln\left(\Omega^{\delta\, e^{-\kappa z}}\right)\right)\right]$
$= \frac{\delta\Omega^{-\delta e^{-\kappa z}} e^{-\kappa z}}{\Omega^{\delta e^{-\kappa z}} - \tanh^2\left(\alpha\ln\left(\Omega^{\delta\, e^{-\kappa z}}\right)\right)}$
$= \frac{\delta\Omega^{-\delta e^{-\kappa z}}}{1-\tanh^2\left(\alpha\ln\left(\Omega^{\delta\, e^{-\kappa z}}\right)\right)} \cdot e^{-\kappa z}$

So, the solution to:

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}(x^{f(\infty)};\zeta_x, m_x).$$

The solution to this equation is

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}(x^{f(\infty)};\zeta_x, m_x) = \frac{f(\infty)x^{f(\infty)-1}}{1+x^{2f(\infty)}}\left[1-\tanh^2\left(\alpha\ln\left(\zeta_x \cdot x^{m_x}\right)\right)\right]\cdot x^{\alpha}.$$

We can solve for this using a similar approach. Let's define $\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}(x^{f(\infty)};\zeta_x,m_x)$ as

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}\left(\left[\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right]^{\frac{1}{\alpha+\frac{1}{\infty}}};\zeta_x,m_x\right).$$

Then, $\mathrm{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}\left(\left[\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right]^{\frac{1}{\alpha+\frac{1}{\infty}}};\zeta_x,m_x\right)$

$= \frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}} \tan^{-1}\left[\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{\frac{1}{\alpha+\frac{1}{\infty}}};\zeta_x,m_x\right]$

$= \frac{1}{m_x\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{\frac{1-\alpha}{\alpha+\frac{1}{\infty}}}} \cdot \frac{\partial x^{\alpha+\frac{1}{\infty}}}{\partial x^{\alpha+\frac{1}{\infty}}}$

$= \frac{1}{m_x\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{\frac{1-\alpha}{\alpha+\frac{1}{\infty}}}} \cdot x^{\alpha+\frac{1}{\infty}-1}$

$= \frac{x^{\alpha+\frac{1}{\infty}-1}}{m_x\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{\frac{1-\alpha}{\alpha+\frac{1}{\infty}}}}$

Therefore, the final solution for $\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z)$ is

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{x^{\alpha+\frac{1}{\infty}-1}}{m_x\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{\frac{1-\alpha}{\alpha+\frac{1}{\infty}}}}.$$

Now, substitute

$$f(\infty) = \frac{1-\alpha}{\alpha+\frac{1}{\infty}},$$

and the above expression

$= \mathrm{x}^{f(\infty)+\alpha-1} \frac{}{m_x\left(\frac{x^{\alpha+\frac{1}{\infty}}-\zeta_x}{m_x}\right)^{f(\infty)} - \tanh^2(\alpha\ln(\zeta_x\, x^{m_x}))}$

$= \mathrm{x}^{f(\infty)+\alpha-1} \frac{}{1-x^{2f(\infty)}-\tanh^2\left(\alpha\ln\left(\zeta_x\, x^{m_x f(x)}\right)\right)}$

Therefore, our solution total would be:

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{f(\infty)x^{f(\infty)-1}}{1+x^{2f(\infty)}}\left[1-\tanh^2\left(\alpha\ln\left(\zeta_x\cdot x^{m_x}\right)\right)\right]\cdot x^{\alpha}.$$

This completes our demonstration of the intrafunctorial calculus equation given the proof from $\mathcal{G}_{\alpha+\delta,\kappa}\colon R \to R$ to $\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z)$.

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z) = \frac{f(\infty)x^{f(\infty)-1}}{1+x^{2f(\infty)}}\left[1-\tanh^2\left(\alpha\ln\left(\zeta_x\cdot x^{m_x}\right)\right)\right]\cdot x^{\alpha}.$$

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z)=\lim_{n\to\infty}\sum_{n=\infty}^{\infty}\left[\tan^{-1}(x^{f(\infty)};\zeta_x,m_x)\right]\cdot$$

$$\int\limits_{\theta=g(\infty)}^{\infty}\left[\prod_{i=0}^{N}\mu_g(\varphi_i)\cdot\xi_\Omega(n,\alpha,\theta,\delta,\eta)\cdot\pi_\Omega(\infty)\cdot\upsilon_\Omega(\infty)\cdot\phi_\Omega(\infty)\cdot\chi_\Omega(\infty)\cdot\psi_\Omega(\infty)\cdot\right.$$
$$\left.\kappa_\Omega(\infty,\theta,\lambda,\mu)\right]\frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}}dxd\alpha d\rho d\theta d\Delta d\eta\to\infty.$$

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z)=\lim_{n\to\infty}\sum_{n=\infty}^{\infty}\left[\tan^{-1}(x^{f(\infty)};\zeta_x,m_x)\right]\cdot$$

$$\int\limits_{\theta=g(\infty)}^{\infty}\left[\prod_{i=1}^{N}\mu_g(\varphi_i)\cdot\xi_\Omega(n,\alpha,\theta,\delta,\eta)\cdot\pi_\Omega(\infty)\cdot\upsilon_\Omega(\infty)\cdot\phi_\Omega(\infty)\cdot\chi_\Omega(\infty)\cdot\psi_\Omega(\infty)\right]\frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}}dxd\alpha d\rho d\theta d\Delta d\eta\to\infty.$$

$$\mathcal{D}_{\alpha+\frac{1}{\infty},f(\infty)}(z)=$$
$$\lim_{n\to\infty}\sum_{n=\infty}^{\infty}\left[\tan^{-1}(x^{f(\infty)};\zeta_x,m_x)\right]\cdot\int\limits_{\theta=g(\infty)}^{\infty}\left[\prod_{i=1}^{N}\mu_g(\varphi_i)\cdot\xi_\Omega(n,\alpha,\theta,\delta,\eta)\cdot\right.$$
$$\left.\pi_\Omega(\infty)\cdot\upsilon_\Omega(\infty)\cdot\phi_\Omega(\infty)\cdot\chi_\Omega(\infty)\cdot\psi_\Omega(\infty)\right]\frac{\partial}{\partial x^{\alpha+\frac{1}{\infty}}}dxd\alpha d\rho d\theta d\Delta d\eta\to\infty.$$