Additional Write-up for Future Problems.

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Contents

1 Abstract:

Keywords: Partial Differential Equations, Abstract Algebra, Machine Learning.

2 Theorems and Proofs:

Below is several theorems and their attached proofs with optionally included remarks and corollaries.

2.1 Several Theorems, Proofs, and Remarks:

Theorem 2.1. *There exist thee differential equation of a variable $t \in \mathbb{R}$ and function $F \in \mathbb{R}$. Yields for a set analytical solutions of n-dimensions:*

$$\mathcal{M}_t + F(t) = \frac{\partial t}{\partial F''(t)} \cdot F'(t),\, t \neq 0. \tag{1}$$

Where $\mathcal{M}_t$ is a tensor of index t in a sequence of tensors $\mathcal{M}$ in a domain of tensors $\mathbb{D}$.

Proof. Per Thoerem 2.1, there exist a proof of construction of a continuous set of solutions for $F \in \mathbb{R}$.
(i) There exist the following per 2.1:

$$\mathcal{M}_t + F(t) = \frac{\partial t}{\partial F''(t)} \cdot F'(t),\, t \neq 0. \tag{2}$$

(ii) Assuming that $\mathcal{M}_t$ is always continuous in the specific n dimension of F, we assume $F(t)$ is thus continuous.
(iii) Thus if F is continuous, then F's derivatives to an nth degree are continuous.
(iv) Thus per (i), (ii), (iii), this completes the proof. ∎

Remark 2.2. Proof 2.1 holds for non-degenerate cases of t and $\mathcal{M}_t$.

Remark 2.3. Proof 2.1 holds for non-degenerate cases of F' and F'', if and only if F is non-degenerate.

2.2 Several Definitions of several PDE of multiple Unknown Parameters:

Let the several definitions in 2.4, 2.5 be Partial Differential Equations (PDE), of parameters x and y in $\mathbb{R}$, and 2.6 be a three diemensional homotopy in $\mathcal{X}$.

Definition 2.4. Let the following inverse PDE defined in $\mathbb{R}$ with a variable limit named $\mathcal{N} \in \mathbb{N}$.

$$\mathcal{F}(x,y)^{-1} = \frac{\partial^p x}{\partial y^p} - \prod_{n=1}^{\mathcal{N}} \frac{\partial^n x}{\partial y^n}. \tag{3}$$

Where F does not converge when $x = 0$ and $x = y$.
An inverted definition of F in $\mathbb{R}$ would be:

$$\mathcal{I}(x,y) = \frac{1}{\mathcal{F}(x,y)^{-1}},$$
$$\mathcal{I}(x,y) = \frac{1}{\frac{\partial^p x}{\partial y^p} - \prod_{n=1}^{\mathcal{N}} \frac{\partial^n x}{\partial y^n}},\, p \neq 0.$$

Definition 2.5. Let the following PDE defined in $\mathbb{R}$ with a variable limit named $\mathcal{N} \in \mathbb{N}^+$.

$$\mathcal{F}(x,y) = \frac{\partial^p x}{\partial y^p} + \prod_{n=1}^{\mathcal{N}} \frac{\partial^n x}{\partial y^n}. \tag{4}$$

Where F does not converge when $x = 0$ and $x = y$.

Definition 2.6. Let the following topological space in $\mathcal{X}$.

$$\mathcal{H}(x,y,t) : [p,n,t] \times [x,y,t] \to \mathcal{X}. \tag{5}$$

Where both variables p, n satifies the following predicates: $p = x$ and $y = n$.

Remark 2.7. Let $\mathcal{X}$ be a three dimensional topological space with an homotopy $\mathcal{H}(x,y,t)$.

3 Conclusion:

References

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