05.03.2020

ELL 707

$x_1(0) \overset{?}{=} x_2'(0) = \dfrac{x_2(0)}{\alpha}$ any will check.

Initially

$\dfrac{dx_1}{dt} \to f(x_1(0), y_1(0), 0) = 0 = g(x_1(0), y_1(0), 0) \leftarrow \dfrac{dy_1}{dt}$

$\dfrac{dx_2}{dt} \to f(x_2'(0), y_2(0), 0) = 0 = g(x_2'(0), y_2(0), 0) \leftarrow \dfrac{dy_2}{dt}$

$$f(x_1(0), y_1(0), u_1(0)) = 0$$

$$f(\underbrace{x_2(0)}_{\alpha x_2'(0)}, \underbrace{y_2(0)}_{y_1(0)}, \underbrace{u_2(0)}_{\alpha u_1(0)}) = 0$$

$$\Rightarrow f(\alpha x_2'(0), \underbrace{y_2(0)}_{=y_1(0)}, \alpha u_1(0)) = 0$$

$$\Rightarrow \alpha f(x_2'(0), \underbrace{y_2(0)}_{=y_1(0)}, u_1(0)) = 0$$

$\alpha \neq 0$

$$\Rightarrow f(x_2'(0), y_1(0), u_1(0)) = 0$$

$$\overset{?}{\Rightarrow} \quad x_1(0) = x_2'(0)$$

Is it always the case that this happens.

Statement: Given, $f(\alpha x, y, \alpha u) = \alpha f(x, y, u)$.

Then: $f(x_1, y, u) = 0 = f(x_2, y, u)$

$$\Rightarrow x_1 = x_2$$

since f is homogeneous in x, u of degree 1,

$\therefore f \sim xy + uy$

These are not multi-valued functions.

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some property relating homogeneity of f and f being a one-one function

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Fold. Change Detection in signalling systems ~2009