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Special Applications
Theory of noise induced processes in
Volume 2
Noise in nonlinear dynamical systems

1. C. Coello
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Theorem 1. The equation $x^3 + y^3 = z^3$ has no non-trivial integer solutions.

Proof. Assume for contradiction that there exist non-trivial integers $x$, $y$, and $z$ such that $x^3 + y^3 = z^3$. Without loss of generality, assume that $x$ and $y$ are relatively prime. Since $x^3$ and $y^3$ have the same parity, $z^3$ must also have the same parity, which means that $x$, $y$, and $z$ must all have the same parity. Let $p$ be a prime that divides both $x$ and $y$. Then $p$ divides $z$ as well, which contradicts the assumption that $x$, $y$, and $z$ are relatively prime. Therefore, there are no non-trivial integer solutions to the equation $x^3 + y^3 = z^3$. $\square$

Theorem 2. The function $f(x) = x^2 + 1$ is injective.

Proof. Suppose $f(x) = f(y)$. Then $x^2 + 1 = y^2 + 1$, which implies $x^2 = y^2$. Since $x$ and $y$ are non-negative, we have $x = y$. Therefore, $f(x)$ is injective. $\square$

Theorem 3. The group $(\mathbb{Z}, +)$ is abelian.

Proof. Let $a, b \in \mathbb{Z}$. Then $a + b = b + a$, which shows that $(\mathbb{Z}, +)$ is abelian. $\square$
\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.11)

\[
\begin{align*}
(1 - t)F + \left( \frac{x}{1 - t} \right) F &= \int (1 - t) F + \left( \frac{x}{1 - t} \right) F \\
\text{where} & \quad \int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\end{align*}
\]

\[
\frac{\partial}{\partial t} \frac{\partial}{\partial x} = f(x)
\]

(8.4.12)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.13)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.14)

\[
\frac{\partial}{\partial t} \frac{\partial}{\partial x} = f(x)
\]

(8.4.15)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.16)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.17)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.18)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.19)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.20)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.21)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.22)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.23)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.24)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.25)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.26)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]

(8.4.27)

\[
\left( \frac{3v}{\varphi} \right) \frac{dx}{dx} = f(x)
\]

(8.4.28)

The quadratic is an expression of the form of the quadratic equation.

Combining (8.4.11) with (8.4.10), we find the following for each wave more the

\[
\int (1 - t) F + \left( \frac{x}{1 - t} \right) F = (t)
\]
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