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$$2. \quad \frac{\partial w}{\partial t} + \frac{\partial^3 w}{\partial x^3} - 6w \frac{\partial w}{\partial x} + \frac{1}{2t} w = 0.$$

Cylindrical Korteweg–de Vries equation.

The transformation

$$w(x, t) = -\frac{x}{12t} - \frac{1}{2t} u(z, \tau), \quad x = \frac{z}{\tau}, \quad t = -\frac{1}{2\tau^2}$$

leads to the Korteweg–de Vries equation 5.1.1:

$$\frac{\partial u}{\partial \tau} + \frac{\partial^3 u}{\partial z^3} - 6u \frac{\partial u}{\partial z} = 0.$$

References

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Cylindrical Korteweg–de Vries Equation

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<http://eqworld.ipmnet.ru/en/solutions/npde/npde5102.pdf>