

5.
$$y_{xx}'' = f(y + ax^2 + bx + c)$$
.

The substitution $w = y + ax^2 + bx + c$ leads to an autonomous equation of the form 3.1: $w''_{xx} = f(w) + 2a$.

Reference

Polyanin, A. D. and Zaitsev, V. F., *Handbook of Exact Solutions for Ordinary Differential Equations, 2nd Edition,* Chapman & Hall/CRC, Boca Raton, 2003.

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http://eqworld.ipmnet.ru/en/solutions/ode/ode0305.pdf