12. $y''_{xx} = e^{-ax} f(e^{ax} y).$

The transformation $z = e^{ax} y,\ w = y'_x/y$ leads to a first-order equation: $z(w+a)w'_z = z^{-1} f(z) - w^2.$

Reference

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