



9. $F(x, xy'_x - my, y_x^{(m+1)}, y_x^{(m+2)}, \dots, y_x^{(n)}) = 0, \quad m = 1, 2, \dots, n - 1.$

The substitution $w = xy'_x - my$ leads to an $(n - 1)$ st-order equation:

$$F(x, w, \zeta, \zeta'_x, \dots, \zeta_x^{(n-m-1)}) = 0, \quad \text{where } \zeta = w_x^{(m)}/x.$$

Reference

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