4. Higher-Order Linear Ordinary Differential Equations

1. $y'''_{xxx} + \lambda y = 0.$

2. $y'''_{xxx} = ax^{\beta} y.$

3. $(x-a)^3(x-b)^3 y'''_{xxx} - cy = 0, \qquad a \neq b.$

4. $(ax^2 + bx + c)^3 y'''_{xxx} = ky.$

5. $y''''_{xxxx} + ay = 0.$

6. $y''''_{xxxx} + ax^n y''_{xx} + b(ax^n - b)y = 0.$

7. $x^2 y''''_{xxxx} + 6xy'''_{xxx} + 6y''_{xx} - a^2 y = 0.$ *Equation of transverse vibrations of a pointed bar.*

8. $(ax^2 + bx + c)^4 y''''_{xxxx} = ky.$

9. $y^{(6)}_x + ay = 0.$

10. $y^{(2n)}_x = a^{2n} y.$

11. $y^{(n)}_x = axy + b, \qquad a > 0.$

12. $y^{(n)}_x = ax^{\beta} y.$

13. $(ax + b)^n (cx + d)^n y^{(n)}_x = ky.$

14. $(ax^2 + bx + c)^n y^{(n)}_x = ky.$

15. $a_n y^{(n)}_x + a_{n-1} y^{(n-1)}_x + \cdots + a_1 y'_x + a_0 y = 0.$ *Constant coefficient linear equation.*

16. $a_n x^n y^{(n)}_x + a_{n-1} x^{n-1} y^{(n-1)}_x + \cdots + a_1 x y'_x + a_0 y = 0.$ *Euler equation.*

