

# Test 1

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**Problem 1.** a. Use the Frobenius method to find a series expansion of  $x = -2$  of the general solution of the equation

$$x(x+2)y'' + (x+1)y' - 4y = 0.$$

b. Use your answer to part a. to find a series solution of the BVP

$$x(x+2)y'' + (x+1)y' - 4y = 0, \quad y(-2) = y(-1.5) = 1.$$

*Solution.*

□

**Problem 2.** a. Transform the equation  $x(x+2)y'' + (x+1)y' - 4y = 0$  to the form

$$\ddot{y} + t^{-1}p(t)\dot{y} + t^{-2}q(t)y = 0 \quad (1)$$

and use the result to determine whether the point at  $\infty$  is an ordinary, regular singular, or irregular singular point for the original equation.

b. Apply an appropriate method to equation (1) to obtain two series that represent linearly independent solutions of the original equation as  $x \rightarrow +\infty$ .

*Solution.*

□

**Problem 3.** Find the first three terms in the asymptotic expansion as  $x \rightarrow +\infty$  of a solution of the equation

$$y''' + \frac{y'}{x^3} = x.$$

*Solution.*

□