Discovery Exercise for the Method of Frobenius

A “generalized power series” is a function in the following form, where $r$ is any constant.

$$y = x^r(c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \ldots) = c_0 x^r + c_1 x^{r+1} + c_2 x^{r+2} + c_3 x^{r+3} + \ldots$$

1. Based on this form, find $y'$ and $y''$.

2. Plug the given $y$, $y'$, and $y''$ into the differential equation $x^2 y'' + 8xy' + 12y = 0$.

3. Set the coefficients of $x^r$ on the left and right sides of your equation equal to each other, and solve the resulting equation for $r$.

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