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Math 2680

Assignment

5.6.1

2) $x^2y'' + xy' - y = \frac{4}{x^2}$, $y_1 = x$

$y = ux \qquad y' = u'x + u$

$y'' = u''x + 2u'$

$x^2(u''x + 2u') + x(u'x + u) - (ux) = \frac{4}{x^2}$

$x^3u'' + 2x^2u' + x^2u' + xu - xu = \frac{4}{x^2}$

$x^3u'' + 3x^2u' = \frac{4}{x^2}$

$u'' + \frac{3u'}{x} = \frac{4}{x^5}$

$z' + \frac{3}{x}z = \frac{4}{x^5} \qquad z = vx \qquad v'x = \frac{4}{x^5}$

$v' = \frac{4}{x^6} \qquad v = \frac{-4}{5x^6} + C_1$

$u' = z = vx = \left(\frac{-4}{5x^6} + C_1\right)x = \int \frac{-4}{5}x^{-5} + C_1x$

$u = \frac{-4}{5} \cdot -4x^{-4} + \frac{C_1x^2}{2} + C_2$

$y = ux = \frac{16}{5}x^{-4} \cdot x + \frac{C_1x^3}{2} + C_2x$

$$y = \frac{16}{5}x^{-3} + \frac{C_1 x^3}{2} + C_2 x$$

if $C_1 = C_2 = 0$ then $y_p = \frac{16}{5}x^{-3}$

so $y = \frac{16}{5}x^{-3} + C_1 x^3 + C_2 x$