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Quiz 4 427J

1. Find the general solution to

$$y'' + 2y' + y = e^{3t}$$

$y(t) = y_p + y_n$

$y'' + 2y' + y = 0 \longrightarrow r^2 + 2r + 1 = 0$

$(r+1)^2 = 0$

$r = -1$ (double root)

$y_n = C_1 e^{-t} + C_2 te^{-t}$

$\psi = Ae^{3t} \rightarrow y_p$

$\psi' = 3Ae^{3t}$

$\psi'' = 9Ae^{3t}$

$\psi'' + 2\psi' + \psi = e^{3t}$

$9Ae^{3t} + 2(3Ae^{3t}) + Ae^{3t} = e^{3t}$

$9Ae^{3t} + 6Ae^{3t} + Ae^{3t} = e^{3t}$

$\frac{(9A+6A+A)e^{3t}}{e^{3t}} = \frac{e^{3t}}{e^{3t}}$

$\frac{16A}{16} = \frac{1}{16}$

$A = 1/16$

$y(t) = y_p + y_n$

$\therefore \; = \frac{e^{3t}}{16} + C_1 e^{-t} + C_2 te^{-t}$