MAT 257 (Differential Equations) Prof. Swift

Worksheet 33, Final Exam Review: Higher order ODEs.

1- Fill in the blanks.

Roots of char. equation	$r=2,5$	$r=-1,-1$	$r=\pm 2i$
char. eqn. in factored form	$(r-2)(r-5)=0$	$(r+1)^2=0$	$r^2+4=0$ or $(r-2i)(r+2i)=0$
LHODECC in operator form / standard form	$(D-2)(D-5)y=0$ / $y''-7y'+10y=0$	$(D+1)^2y=0$ / $y''+2y'+y=0$	$(D^2+4)y=0$ / $y''+4y=0$
General Solution	$y=c_1e^{2t}+c_2e^{5t}$	$y=c_1e^{-t}+c_2te^{-t}$	$y=c_1\cos(2t)+c_2\sin(2t)$
Particular Solution	$y=17e^{2t}+52e^{5t}$	$y=3te^{-t}$	$y=5\sin(2t)$

2. (Problem 7 from the sample Final Exam.)
Find the form of the particular solution, but do not evaluate the undetermined coefficients, of the ODE $y''' + y' = te^t \sin(t) + 3t^2 + t - 1$

- The "rule 1" original form of y_p is:

$$y_p = Ae^t\cos(t) + Be^t\sin(t) + Cte^t\sin(t) + Dte^t\cos(t) + E + Ft + Gt^2$$

- $y_h = C_1 + C_2\cos(t) + C_3\sin(t)$

$r^3 + r = 0$, $r(r^2+1) = 0$, $r = 0, \pm i$

- The "rule 2" final form of y_p is:

$$y_p = (A + Ct)e^t\cos(t) + (B + tD)e^t\sin(t) + t(E + Ft + Gt^2)$$

Note: $y_p = E$ is in y_h, but $y_p = Ae^t\cos(t)$ is NOT in y_h.