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Math 202 Sample Second Major Examination.

1. The solution of $y''' - 2y'' + 2y' = 0$ is given by $y_{CF}(x) = c_1 + e^x\,(c_2 \cos x + c_3 \sin x)$.

   In each section of the box below is an ode with its particular solution.

ODE	Particular solution
$y''' - 2y'' + 2y' = 2\cos 4x$	$y_{P1}(x) = \dfrac{1}{65}\left(\cos 4x - \dfrac{7}{4}\sin 4x\right)$
$y''' - 2y'' + 2y' = -\cos 2x$	$y_{P2}(x) = \dfrac{1}{10}\left(\dfrac{1}{2}\sin 2x - \cos 2x\right)$
$y''' - 2y'' + 2y' = 3$	$y_{P3}(x) = \dfrac{3}{2}x$

   Obtain the general solution of $y''' - 2y'' + 2y' = 130\cos 4x - 10\cos 2x + 6$.

2. Find a linear constant coefficient ode with $\left\{1,\ e^{-x}\sin x,\ e^{-x}\cos x\right\}$ as a fundamental set of solutions.

3. Find the general solution of $y''' - 9y'' + 25y' - 17y = 0$ given that $y = e^x$ is a solution

4. Obtain the general solution of the differential equation $y'' + y = \sec^3 x$ given that $y_1(x) = \sin x,\ y_2(x) = \cos x$ form a fundamental set of solutions for $y'' + y = 0$.

5. Use the annihilator approach to determine the **form** of the particular solution for the differential equation

$$y'' + 9y = \cos 3x$$

6. Obtain the general solution of the differential equation: $xy'' - 2(1+x)y' + (x+2)y = 0$. (Hint: Try $y = e^x$.)