MT1612: EXAMPLE SHEET[1] V (for March 24, 1999)

1.) Find the general solutions of the following differential equations

(i) $y'' - y' - 12y = 30e^{2x}$,

(ii) $\ddot{y} + 8\dot{y} + 20y = 20t^2 + 36t + 30$,

(iii) $\ddot{x} - \dot{x} - 2x = 40\cos(2t)$.

2.) For the same differential equations as in question 1, find the solutions that satisfy, respectively, the initial conditions

(i) $y = 2$ and $y' = -7$ at $x = 0$,

(ii) $y = 3$ and $\dot{y} = -7$ when $t = 0$,

(iii) $x = -6$ and $\dot{x} = -1$ when $t = 0$.

3.) Dr. Heil is oscillating his coffee mug on a piece of rubber string. The motion of the mug is governed by the ODE

$$\ddot{x} + 4\dot{x} + 13x = 40\cos(3t).$$

Find the amplitude of the forced oscillations (the mug's, not Dr. Heil's!).

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