การบ้าน 4

ออกวันที่ 10 สิงหาคม พ.ศ. 2553 **ส่งวันที่** 20 สิงหาคม พ.ศ. 2553

1. Find solution of the following differential equations

   a) $y'' + y = \sin x + x\cos x$
   b) $y''' + 3y'' + 3y' + y = 8e^{x} + x + 3$

2. Solve the following initial value problems

   a) $y'' + 4y = 2x$; $y(0) = 1$, $y'(0) = 2$
   b) $y^{(3)} + y'' = x + e^{-x}$; $y(0) = 1$, $y'(0) = 0$, $y''(0) = 1$

3. Convert the following equations into first-order system

   a) $x''' = (x')^2 + \cos x$
   b) $x'' - 5x + 4y = 0$, $y'' + 4x - 5y = 0$

4. A charged particle of mass m and charge q subjected to a static magnetic field $\vec{B} = B\hat{z}$ is moving according to the following force equations

   $$mx'' = qBy', \quad my'' = -qBx'$$

   Suppose that the initial conditions are $x(0) = r_0$, $y(0) = 0$, $x'(0) = 0$, and $y'(0) = -\omega r_0$ where $\omega = qB/m$.

   a) Solve for $x(t)$ and $y(t)$.
   b) What does the particle's trajectory look like? [You may draw or explain in words]

5. Find eigenvalues, eigenvectors, and solution of the following system:

   $$x_1' = 5x_1 + 5x_2 + 2x_3$$
   $$x_2' = -6x_1 - 6x_2 - 5x_3$$
   $$x_3' = 6x_1 + 6x_2 + 5x_3$$