1. Use the equation $y = ax^2 + bx + c$ and the least square method to simulate the following data

x	1	2	3	4
y	3	1	4	6

   How are these values of a, b and c ?(20%)

2. Solve $\dfrac{d^2 y}{dx^2} + 2\dfrac{dy}{dx} + y = x + 3$, with the initial conditions $y(0) = 2$, $\dfrac{dy(0)}{dx} = 1$. (20%)

3. A surface is described by the equation $z = x^2 + y^2$. Find the unit normal vector and the tangent plane at the point (1, 1, 2). (10%)

4. Solve the diffusion equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2} + e^{-t}$, $0 \le x \le 1$, $0 \le t$, with the boundary conditions $u(0,t) = u(1,t) = 0$, and the initial condition $u(x,0) = 0$. (25%)

5. Solve $\dfrac{d}{dt}\begin{Bmatrix} x \\ y \end{Bmatrix} = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}\begin{Bmatrix} x \\ y \end{Bmatrix} + U(t)\begin{Bmatrix} 1 \\ 0 \end{Bmatrix}$, $U(t)$ is the unit step function, and

   the initial conditions $\begin{Bmatrix} x \\ y \end{Bmatrix}(0) = \begin{Bmatrix} 0 \\ 1 \end{Bmatrix}$. (25%)