1. Find the general solution of $y' + \dfrac{2}{3}xy = xy^{-2}$ (20%)

2. Solve the ordinary differential equation of $y'' - 4y' + 4y = 6e^{2x}$ (15%)

3. Find the directional derivative of $f(x,y) = \dfrac{x^2 + y^2}{x - y}$ at P: (2, 1) in the direction of $\vec{a} = 3\vec{i} + \vec{j}$ (15%)

4. Solve the linear system by using the Gauss elimination method. (15%)

$3w - 6x + y - z = -11$

$w + x - 2y + 3z = 10$

$2w + 2x - 3y + 2z = 9$

$w - 2x + y - 2z = -8$

5. Solve the partial differential equation of $x\dfrac{\partial w}{\partial x} + \dfrac{\partial w}{\partial t} = xt^2$, $\begin{array}{l} w(x,0) = 0 \quad if \quad x \geq 0 \\ w(0,t) = 0 \quad if \quad t \geq 0 \end{array}$ (20%)

6. Find the Fourier cosine transform for $f(x) = kx^2$ if $0 < x < a$, $f(x) = 0$ if $x > a$. (15%)

試題隨卷繳回