

(1) Solve the equations: (a)  $2u_x + u_y = x^2 + y^2$  (b)  $u_{xx} - 3u_{xy} - 4u_{yy} = \cos(4x + y)$

(2) Show that the function  $v(x, y) = x^3 - 3xy^2$  is harmonic and find its conjugate  $u(x, y)$  such that the complex function  $f(z) = u + iv$  is analytic.

(3) Determine and sketch the image of the region bounded by  $0 \leq y \leq 3$ ,  $0 \leq x \leq \pi/2$  under the function  $f(z) = \sin z$ .

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*Good Luck*

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