1) Does a solution exist to the following Laplacian PDE? If the solution exists, find the solution. Otherwise, explain why a solution cannot exist. [50 pts]

$$\nabla^2 u = 0 \qquad 0 \le r \le 1 \qquad 0 \le \theta < 2\pi$$
$$u_r(1,\theta) = \sin(1.5\theta)$$

2) Solve the following interior Dirichlet problem. [50 pts]

$$\nabla^2 u = 0 \qquad 0 \le r \le 5 \qquad 0 \le \theta < 2\pi$$
$$u(5,\theta) = \sin(2\theta) + \cos(3\theta) + 2$$