

Exercise 11

Show that there is no solution of

$$\Delta u = f \quad \text{in } D, \quad \frac{\partial u}{\partial n} = g \quad \text{on bdy } D$$

in three dimensions, unless

$$\iiint_D f \, dx \, dy \, dz = \iint_{\text{bdy}(D)} g \, dS.$$

(*Hint:* Integrate the equation.) Also show the analogue in one and two dimensions.