M4 年級：＿＿＿＿＿＿　　姓名：＿＿＿＿＿＿＿＿＿＿　　學號：＿＿＿＿＿＿＿＿

國立台灣海洋大學河海工程學系２００４工程數學（三）第四次小考解答

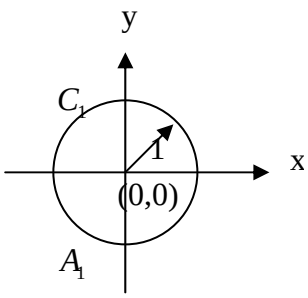
1. $\oint_C (\frac{-y}{x^2+y^2})dx + (\frac{x}{x^2+y^2})dy = ?$

where C_1 and A_1 are shown below.

$x = \cos\theta \quad dx = -\sin\theta d\theta$

$y = \sin\theta \quad dy = \cos\theta d\theta$

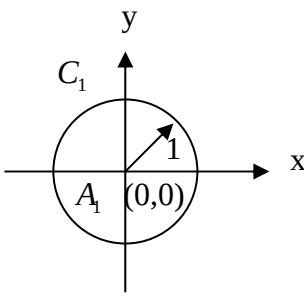
$$\oint_C (\frac{-y}{x^2+y^2})dx + (\frac{x}{x^2+y^2})dy = \oint (\sin^2\theta + \cos^2\theta)d\theta = 2\pi$$



2. $\iint_A [\frac{\partial}{\partial x}(\frac{x}{x^2+y^2}) - \frac{\partial}{\partial y}(\frac{-y}{x^2+y^2})]dA = ?$

where C_1 and A_1 are shown below.

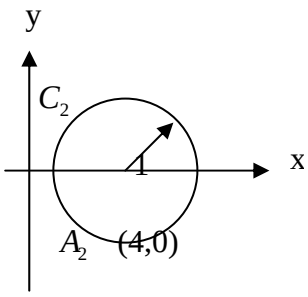
$$\iint_A [\frac{x^2+y^2-2x^2}{(x^2+y^2)^2} + \frac{x^2+y^2-2y^2}{(x^2+y^2)^2}]dA = 0$$



3. $\oint_C (\frac{-y}{x^2+y^2})dx + (\frac{x}{x^2+y^2})dy = ?$

where C_2 and A_2 are shown below.

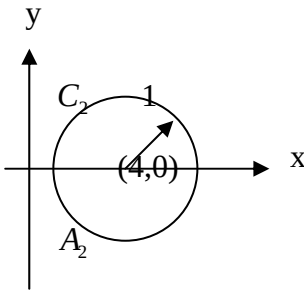
$$\oint_C (\frac{-y}{x^2+y^2})dx + (\frac{x}{x^2+y^2})dy = \int_0^{2\pi} (\frac{1+4\cos\theta}{17+8\cos\theta})d\theta = 0$$



4. $\iint_A [\frac{\partial}{\partial x}(\frac{x}{x^2+y^2}) - \frac{\partial}{\partial y}(\frac{-y}{x^2+y^2})]dA = ?$

where C_2 and A_2 are shown below.

$$\iint_A [\frac{x^2+y^2-2x^2}{(x^2+y^2)^2} + \frac{x^2+y^2-2y^2}{(x^2+y^2)^2}]dA = 0$$



5.Green theorem is ok or not?

Case1：由於Ｐ與Ｑ在 A 中之原點（０，０）不可解析(奇異)，所以 Green theorem 不適用。

Case２：由於Ｐ與Ｑ在 A 中之均可解析，所以 Green theorem 適用。