

Nov. 4, 2010

Midterm Exam - Solution

Q1, Q2 and Q4: refer to lecture notes.

Question 3: null point, current sheet and separatrix

$$B_y + iB_x = \frac{(z^2 + 1)}{(z^2 - 1)^{1/2}} = f(z)$$

Ans:

Far field $z \gg 1 \Rightarrow B_y + iB_x = \frac{z^2}{z} = z$

$$\Rightarrow \begin{cases} B_x = y \\ B_y = x \end{cases}$$

Near field:

null points $f(z) = 0 \quad z^2 + 1 = 0$

$$\Rightarrow z = \pm i \Rightarrow N_1, N_2$$

Singularity points. $f(z) \rightarrow \infty \quad z^2 = 1$

$$\Rightarrow z = \pm 1 \Rightarrow S_1, S_2$$

