

UNIQUENESS THEOREM

(9)

- Usually introduced with Meth. Images as justification for M.o.I.
- Saw previously in statics

Theorem:

There is only one (unique) sol. to Maxwell's Eq's in a region which satisfies both the Eq's and completely (but not over-specified) BC's.

Proof: Text, pp. 312-314.

Implication: Any sol. method, including guessing, tricks, solving "dual" problems, etc, is OK as long as the sol. passes the Ultimate Test:

- satisfies original Eq(s)
- " " BC's

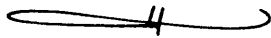
"Complete" B.C.'s

A field in a (lossy) region, created by sources \underline{J}_i & \underline{M}_i is unique within that region when one of the following is specified:

- i) tangential components of \underline{E} over body
- ii) " " " " \underline{H} " "
- iii) $\underline{E}_{\text{tang}}$ on part of Body & $\underline{H}_{\text{tang}}$ on rest of body

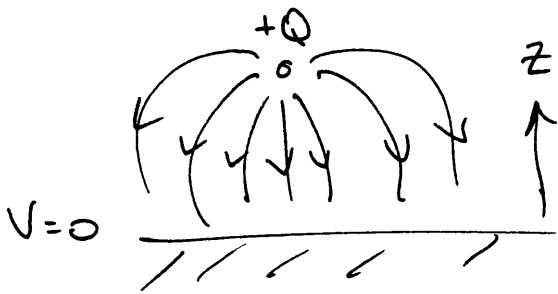
Note: although Proof constructed for dissipative media, lossless is special case as losses $\rightarrow 0$.

- Poisson's Eq = special case of Maxwell's Eq's in the static limit.



Again, most common application is method of Images (M.o.I.).

STATICS EXAMPLE:



Original Problem

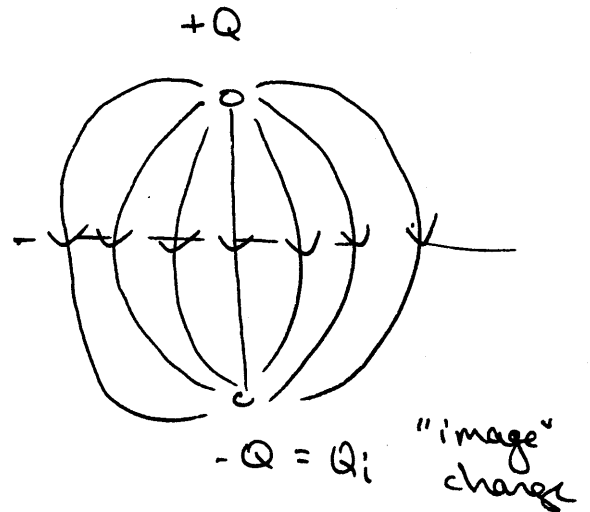
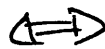


Image Equivalent

These 2 have identical solutions for $z \geq 0$

