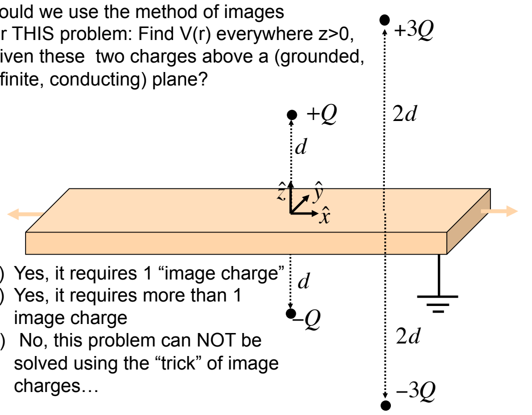
Could we use the method of images for THIS problem: Find V(r) everywhere z>0, Given these two charges above a (grounded, infinite, conducting) plane?

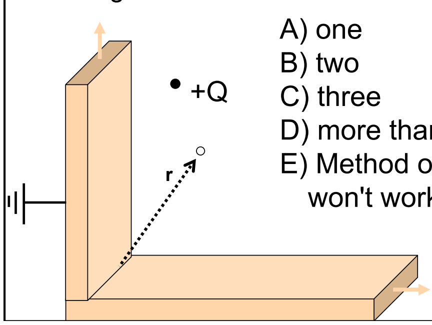


A) Yes, it requires 1 "image charge"
B) Yes, it requires more than 1 image charge
C) No, this problem can NOT be solved using the "trick" of image charges…

On paper (don't forget your name!) in your own words (by yourself):

What is the idea behind the method of images? What does it accomplish? What is its relation to the uniqueness theorem?

3.9 Two ∞ grounded conducting slabs meet at right angles. How many image charges are needed to solve for V(**r**)?



A) one
B) two
C) three
D) more than three
E) Method of images won't work here

Say you have three functions f(x), g(y) and h(z).
f(x) depends on 'x' but not on 'y' and 'z'.
g(y) depends on 'y' but not on 'x' and 'z'.
h(z) depends on 'z' but not on 'z' and 'y'.

If f(x) + g(y) + h(z) = 0 for all x, y, z, then:

A) All three functions are constants (i.e. they do not depend on x, y, z at all.)
B) At least one of these functions has to be zero everywhere.
C) All of these functions have to be zero everywhere.
D) All three functions have to be linear functions in x, y, or z respectively (such as f(x)=ax, a≠0 etc.)

Second uniqueness Theorem: In a volume surrounded by conductors and containing a specified charge density $\rho(r)$, the electric field is uniquely determined if the total charge on each conductor is given. (The region as a whole can be bounded by another conductor, or else unbounded.)

Griffiths, 3.1.6

3.10 Suppose $V_1(\mathbf{r})$ and $V_2(\mathbf{r})$ are linearly independent functions which *both* solve Laplace's equation, $\nabla^2 V = 0$

Does $aV_1(\mathbf{r})+bV_2(\mathbf{r})$ also solve it (with a and b constants)?

A) Yes. The Laplacian is a linear operator
B) No. The *uniqueness theorem* says this scenario is impossible, there are never two independent solutions!
C) It is a definite yes or no, but the *reasons* given above just aren't right!
D) It depends...

What is the value of

$$\int_0^{2\pi} \sin(2x)\sin(3x)dx \quad ?$$

A) Zero

B) π

C) 2π

D) other

E) I need resources to do an integral like this!

3.11

Given the two diff. eq's :

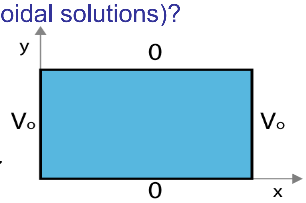
$$\frac{1}{X}\frac{d^2X}{dx^2} = C_1 \qquad \frac{1}{Y}\frac{d^2Y}{dy^2} = C_2$$

where $C_1+C_2 = 0$. Given the boundary conditions in the figure, which coordinate should be assigned to the negative constant (and thus the sinusoidal solutions)?

A) x B) y

C) $C_1 = C_2 = 0$ here

D) It doesn't matter



3.11 c

Given the two diff. eq's:

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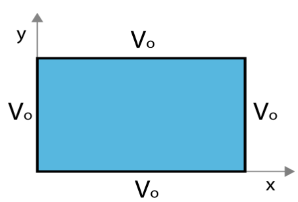
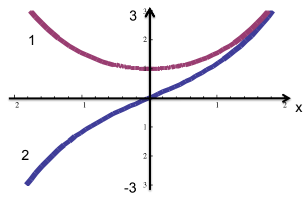
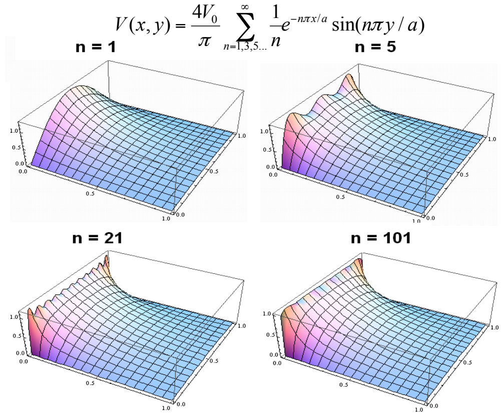


Two solutions for *positive C* are sinh x and cosh x :



Which is which?
A)Curve 1 is sinh x and curve 2 is cosh x
B)Curve 1 is cosh x and curve 2 is sinh x

$$V(x,y) = \frac{4V_0}{\pi} \sum_{n=1,3,5...}^{\infty} \frac{1}{n} e^{-n\pi x/a} \sin(n\pi y/a)$$



3.11 h The X(x) equation in this problem involves the "positive constant" solutions:
A sinh(kx) + B cosh(kx)

What do the boundary conditions say about the coefficients A and B above?

A) A=0 (pure cosh)

B) B=0 (pure sinh)

C) Neither: you should rewrite this in terms of A' e^{kx} + B' e^{-kx} !

D) Other/not sure?