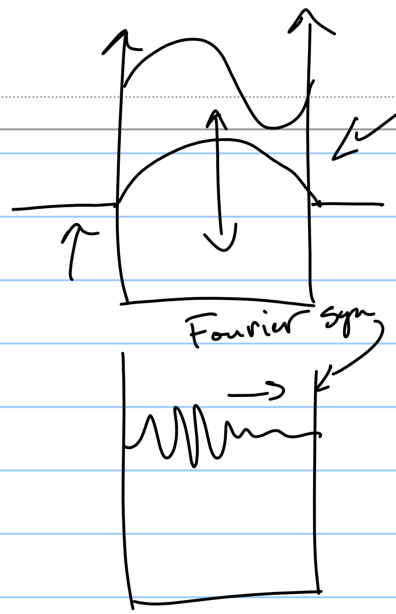
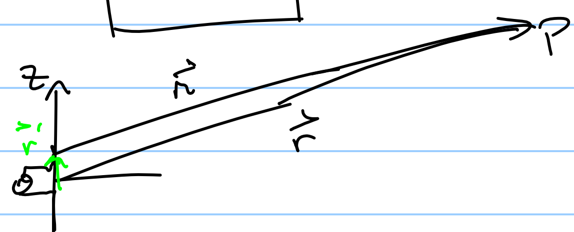
Note Title 8/2/2006

PDE $\Rightarrow$ sep variable $\Psi = \psi(x)\,c(t)$

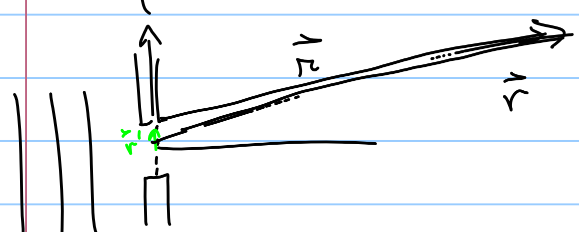


ψ & $\left.\dfrac{\partial\psi}{\partial x}\right|_{\text{bndry}}$ cont.

$=$



$\vec{J}(\vec{r}\,',t) = \vec{J}(\vec{r}\,')\,e^{i\omega t}$



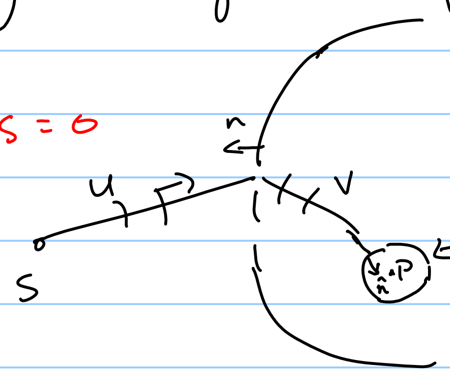
Kirchoff formulation

– Greens th. $$\int_{vol} \left(V\nabla^2 U - U\nabla^2 V\right) d\tau = \oint \left(V\vec\nabla U - U\vec\nabla V\right)\cdot d\vec a$$

assume harmonic functions for U & V & they obey wave eqns $$\nabla^2 U = \frac{1}{c^2}\frac{\partial^2 U}{\partial t^2} = -\frac{\omega^2}{c^2}U$$

$U = U(x,y,z)e^{-i\omega t}$

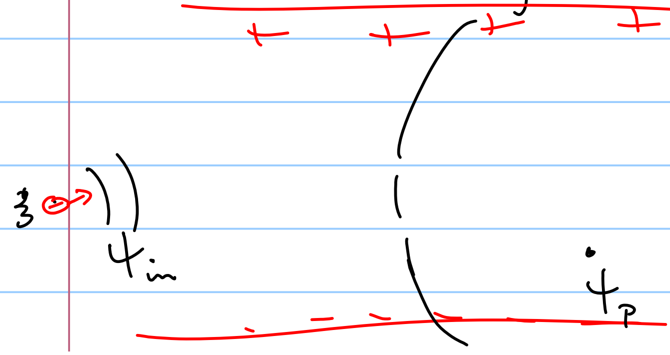
LHS = 0



$$\int_{inner} \left(V\vec\nabla U - U\vec\nabla V\right)\cdot da$$

$$-U_p$$

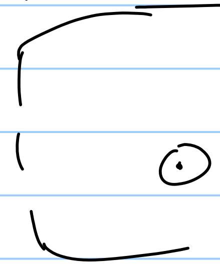
Method for solving the wave eqn (PDE)



– Greens th. $\int_{vol} (v\nabla^2 u - u\nabla^2 v)\, d\tau = \oint (v\vec{\nabla} u - u\vec{\nabla} v)\cdot d\vec{a}$

a) $-\frac{\hbar^2}{2m}\nabla^2\psi = i\hbar\frac{\partial\psi}{\partial t}$ free particle $\psi = \psi(x,y,z)e^{-i\omega t}$

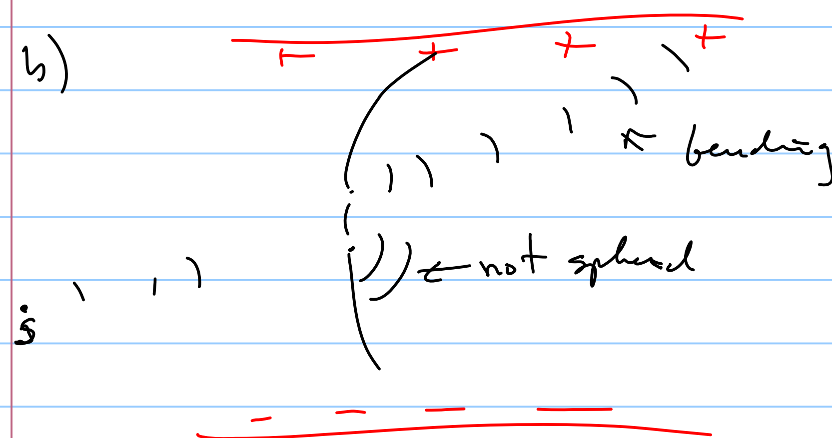
$-\frac{\hbar^2}{2m}\nabla^2 v = i\hbar\frac{\partial v}{\partial t}$ $\quad v(i\hbar)(-i\omega)\psi - \psi(-i\omega)(i\hbar)v = 0$



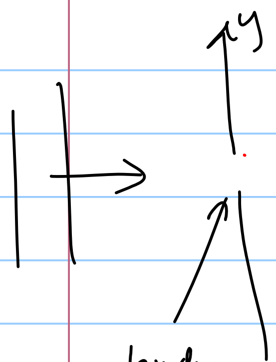
$\int_{inner} \propto \psi_p$

Can use Kirch formulation for free particle

b)

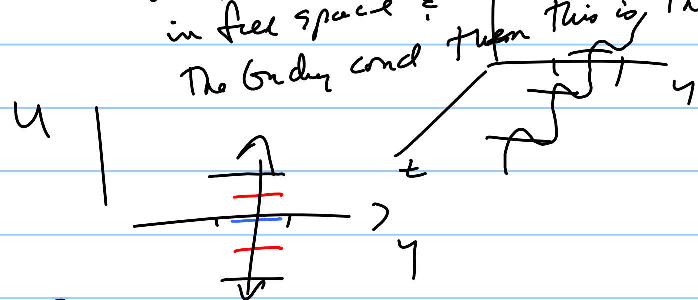


$$\nabla^2 u = \frac{1}{c/n}\frac{\partial^2 u}{\partial t^2} = \frac{n(x,y,z)}{c}\frac{\partial^2 u}{\partial t^2}$$

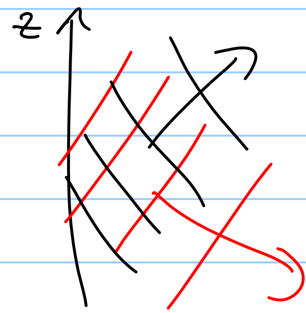


bndry condition

use soln which satisfies wave eqn in free space & u also satisfies the bndry cond then this is the soln.

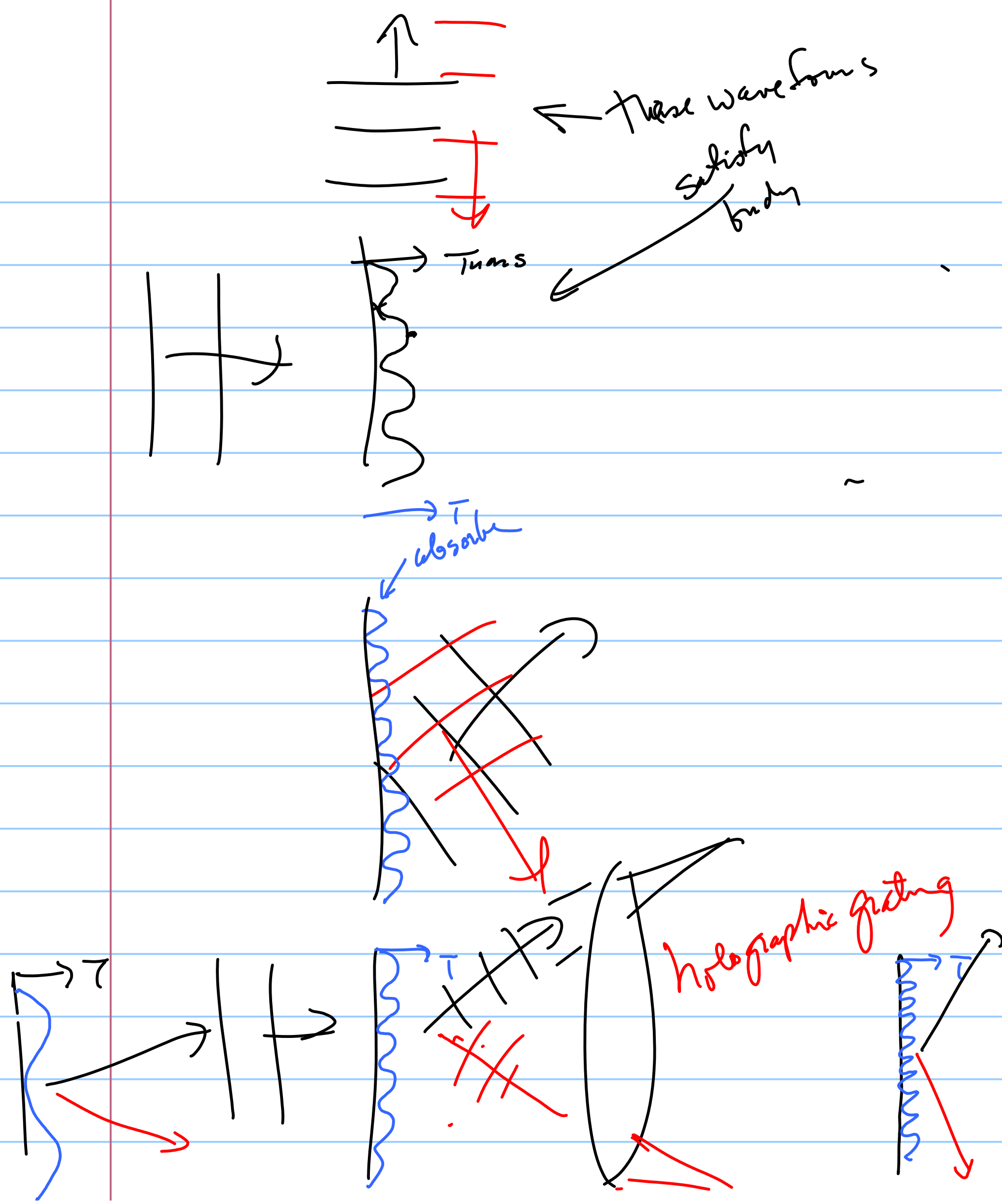


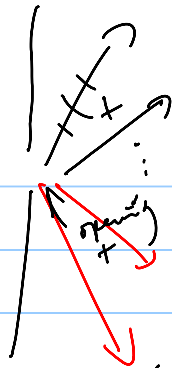
Solve $\nabla^2 u = \frac{1}{c^2}\frac{\partial^2 u}{\partial t}$

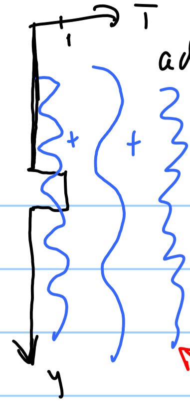


These 2 waves satisfy wave eqn in free space, what bndry condition is satisfied?

same λ & ν & c

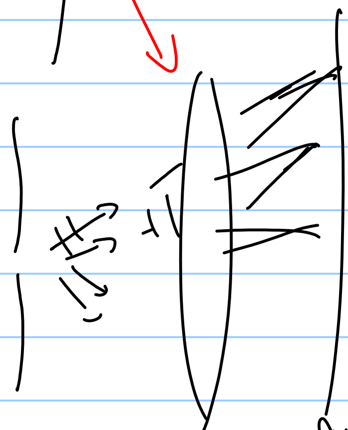

these waveforms
satisfy
bndy
Trans
T
absorb
holographic grating





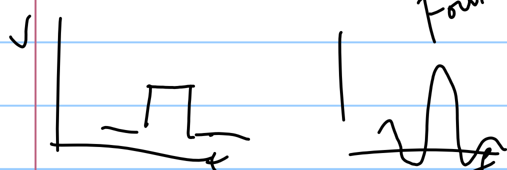
add harmonic waves of diff λ to construct this Trans

spatial frequencies

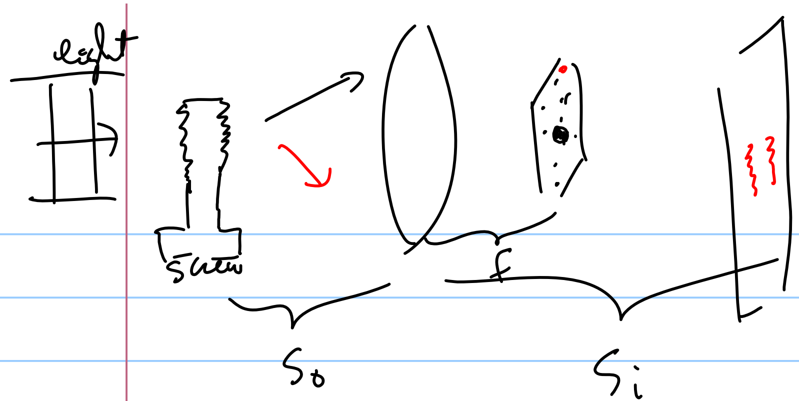


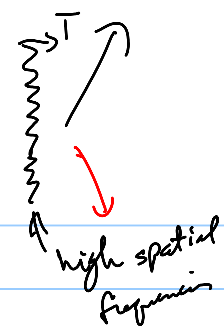
focal plane

Fourier trans form of the object



Angular spectrum





Fourier Optics