$$f(t) = \cos(\omega t) = \cos(2\pi a t)$$

$$F(\nu) = \int_{-\infty}^{\infty} f(t)\, e^{-2\pi i \nu t}\, dt$$

$$\cos(x) = \frac{e^{ix} + e^{-ix}}{2}$$

$$\cos(2\pi a t) = \frac{e^{i2\pi a t} + e^{-i2\pi a t}}{2}$$

$$F(\nu) = \int_{-\infty}^{\infty} \left(\frac{e^{i2\pi a t} + e^{-i2\pi a t}}{2} \right) e^{-2\pi i \nu t}\, dt$$

$$F(\nu) = \frac{1}{2} \left[\int_{-\infty}^{\infty} e^{i2\pi t(a-\nu)} + \int_{-\infty}^{\infty} e^{i2\pi t(-a-\nu)} \right] dt$$

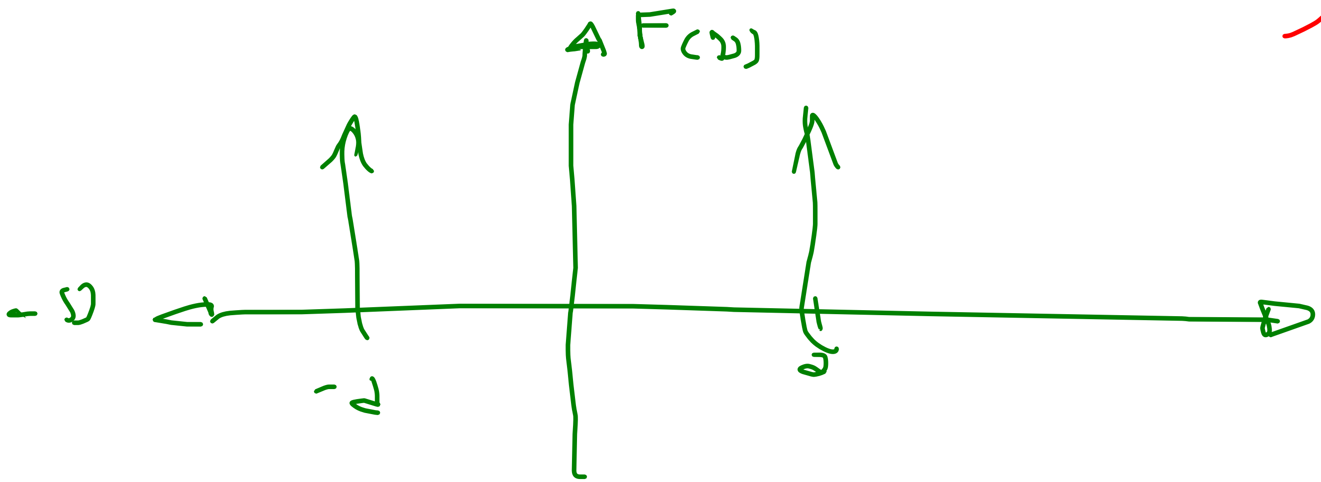
$$F(\nu) = \frac{1}{2}\left[\int_{-\infty}^{\infty} e^{i2\pi t(a-\nu)} + \int_{-\infty}^{\infty} e^{i2\pi t(-a-\nu)}\right] dt$$

we know $\delta(t-a) = \int_{-\infty}^{\infty} e^{2\pi i \nu (t-a)}\, d\nu$

$$F(\nu) = \frac{1}{2}\left[\delta(-\nu + a) + \delta(-\nu - a)\right]$$

$2\pi a = \omega$

$a = \omega / 2\pi$



Lap. Trans

Time		Laplace
$f(t)$	$\longleftrightarrow$	$F(s)$
$\dot{f}(t)$	$\longleftrightarrow$	$sF(s) - f(0)$
$\ddot{f}(t)$	$\longleftrightarrow$	$s^2F(s) - sf(0) - \dot{f}(0)$

EOM $\quad m\ddot{x} + c\dot{x} + kx = f(t)$

$$m\mathcal{L}[\ddot{x}(t)] + c\mathcal{L}[\dot{x}(t)] + k\mathcal{L}[x(t)] = \mathcal{L}[f(t)]$$

$$m\left[s^2X(s) - sx(0) + k\right] + c\left[sX(s) - x(0)\right] + kX(s) = F(s)$$

$$X(s)\left[ms^2 - cs - k\right] - \left[ms\cancel{x(0)}^{\,0} + m\cancel{\dot{x}(0)}^{\,0} + c\cancel{x(0)}^{\,0}\right] = F(s)$$

$$Y(s)\left[ms^2 - cs - k\right] - \left[ms\,\cancelto{0}{y(0)} + m\,\cancelto{0}{\dot{y}(0)} + c\,\cancelto{0}{y(0)}\right] = F(s)$$

$$Y(s)\left[ms^2 + cs + k\right] = F(s)$$

$$H(s) = \frac{Y(s)}{F(s)}$$

$$H(s) = \frac{1}{ms^2 + cs + k}$$

$$H(i\omega) = \frac{1}{-m\omega^2 + i\omega c + K}$$

$$|H(i\omega)| = \frac{1}{\sqrt{(1-\beta^2)^2 + (2\xi\beta)^2}}$$

$$A_s = \frac{A_o}{A_i}$$

if $A_o = 1$ & $\phi_o = 0$

$$A_i = \sqrt{Re^2 + Im^2}$$

$$A_i = \sqrt{(K - m\omega^2)^2 + (\omega c)^2}$$

$$A_i = \sqrt{(1-\beta^2)^2 + (2\xi\beta)^2}$$