Hw#2

Dirac Delta

$$f(x) = \begin{cases} 0 \geq 0 \\ \infty = 0 \\ 0 < 0 \end{cases}$$

Define

$$\mathcal{F}(f(w)) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x) e^{-iwx} dx$$

$$= \frac{1}{\sqrt{2\pi}} \left[\int_{-\infty}^{0} (0) e^{-iwx} dx + \int_{0}^{0} (\infty) e^{-iwx} dx + \int_{0}^{\infty} (0) e^{-iwx} dx \right]$$

$$= \frac{1}{\sqrt{2\pi}} \left[\int_{0}^{0} \infty e^{-iwx} dx \right]$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{e^{-iwx}}{-iw} \right]_{0}^{0}$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{e^{0}}{0} \right)$$

$$= 0$$

a) magnitude will be 0

2) In one case the time will yield $\boxed{\frac{\pi}{2}}$

In the other case the time will yield $\boxed{\frac{3\pi}{2}}$

$$\phi v = \pm \tan^{-1}(\mathrm{Im}(v)/\mathrm{Re}(v))$$

$$\phi_1 = \frac{\pi}{2} \qquad \phi_2 = \frac{3\pi}{2}$$