

COSC 360 HW #2

2. Compute the fourier transform of
 $f(t) = \delta(t - t_0)$

$$F(\omega) = \int_{-\infty}^{\infty} f(t) \exp(j\omega t) dt = \delta(\cos(\omega t_0) - j\sin(\omega t_0))$$

$$\Rightarrow \delta(\cos(\omega t_0) - j\sin(\omega t_0))$$

$$\Rightarrow \delta e^{j\omega t_0}$$

$$F(\omega) = \delta e^{j\omega t_0}$$

a) Find the magnitude of $F(\omega)$

$$|F(\omega)|^2 = (\delta e^{j\omega t_0})^2$$

$$= \delta^2 (e^{j\omega t_0})^2$$

$$= \delta^2 (\cos^2(\omega t_0) - j\sin^2(\omega t_0))$$

$$= \delta^2 (1)$$

$$|F(\omega)|^2 = \delta^2$$

b) Compute the phase

$$F(\omega) = \delta e^{j\omega t_0}$$

$$\phi = -\omega t_0$$

$$* y(x) = -2x$$

$$y' = -2$$

$$-y' = 2$$

c) Compute the group delay

$$-\frac{d\phi}{d\omega} = t_0$$