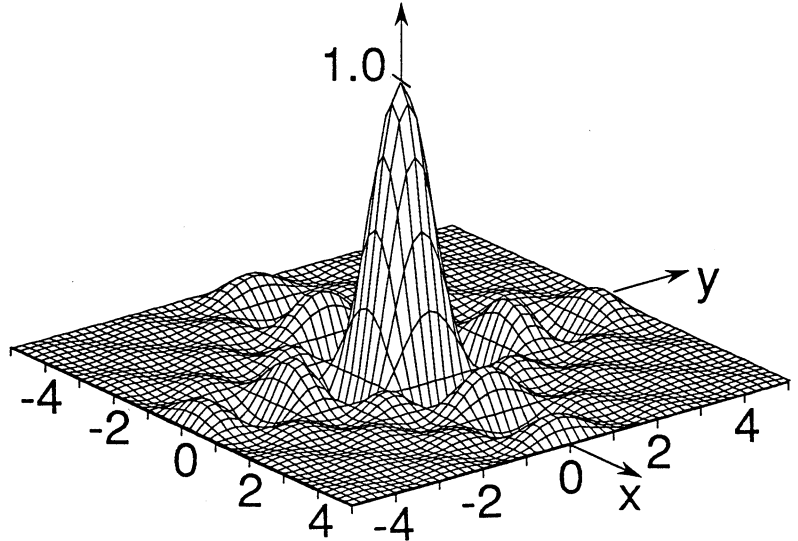
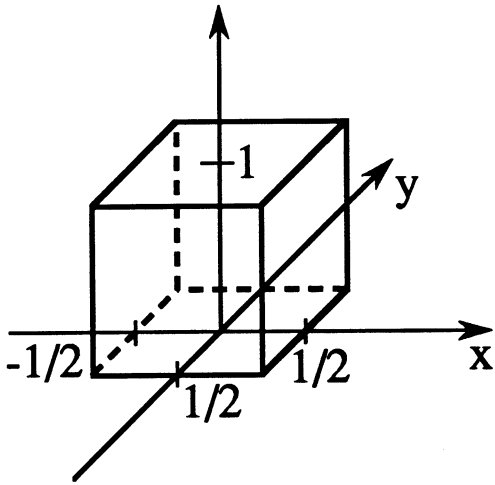
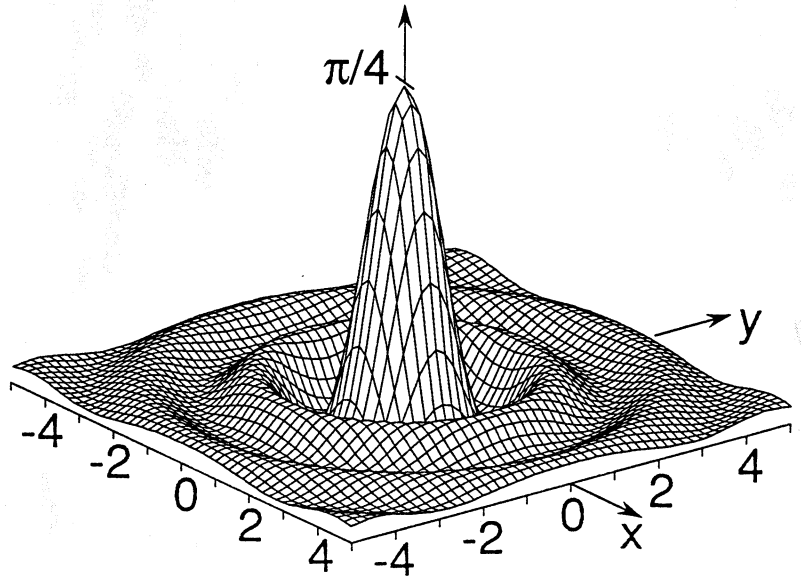
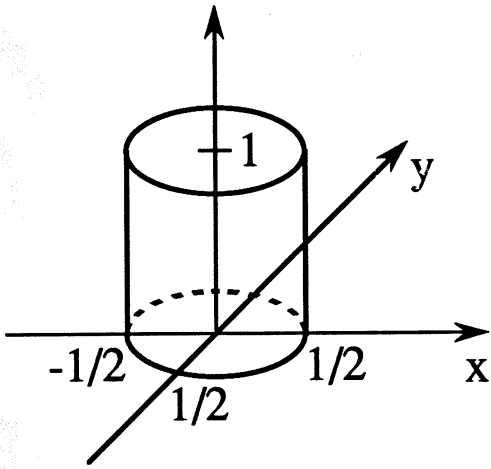


2.1.1 SPECIAL 2-D SIGNALS



$$\text{rect}(x,y) = \begin{cases} 1, & |x|, |y| < 1/2 \\ 0, & |x|, |y| > 1/2 \end{cases}$$

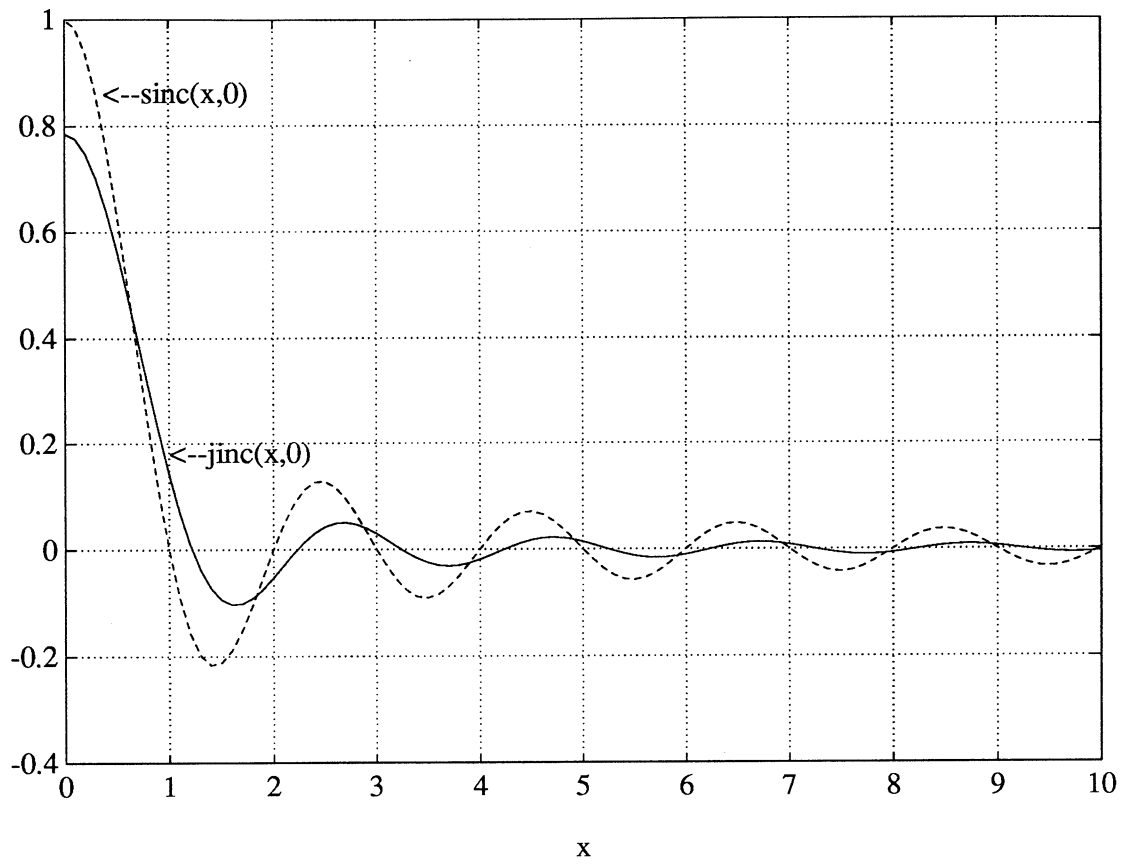
$$\text{sinc}(x,y) = \frac{\sin(\pi x)}{\pi x} \frac{\sin(\pi y)}{\pi y}$$



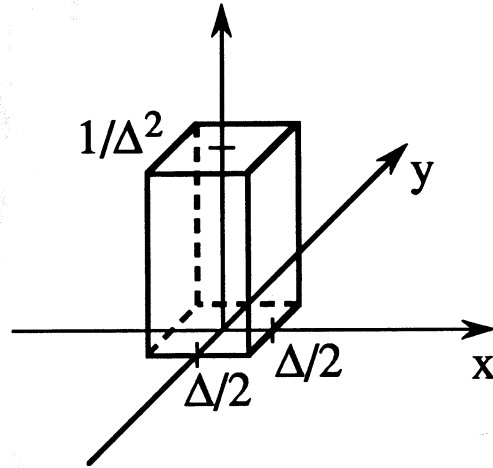
$$\text{circ}(x,y) = \begin{cases} 1, & \sqrt{x^2 + y^2} < 1/2 \\ 0, & \sqrt{x^2 + y^2} > 1/2 \end{cases} \quad \text{jinc}(x,y) = \frac{J_1\left(\pi\sqrt{x^2 + y^2}\right)}{2\sqrt{x^2 + y^2}}$$

(Bessel function of 1st kind order 1)

COMPARISON OF 2-D JINC AND SINC FUNCTIONS



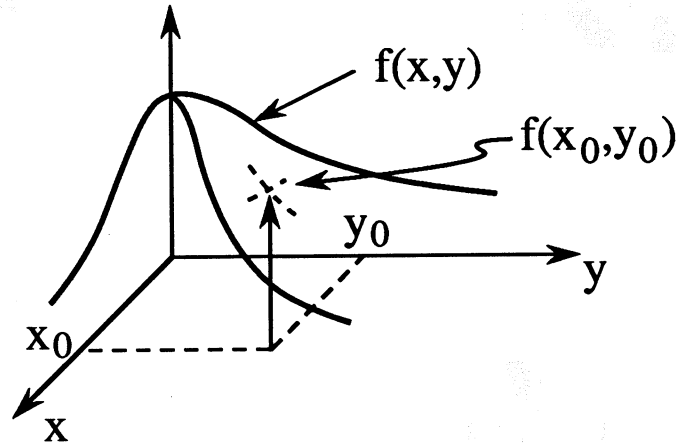
2-D Impulse Function



$$\delta(x, y) = \lim_{\Delta \rightarrow 0} \frac{1}{\Delta^2} \text{rect} \left(\frac{x}{\Delta}, \frac{y}{\Delta} \right)$$

Sifting Property

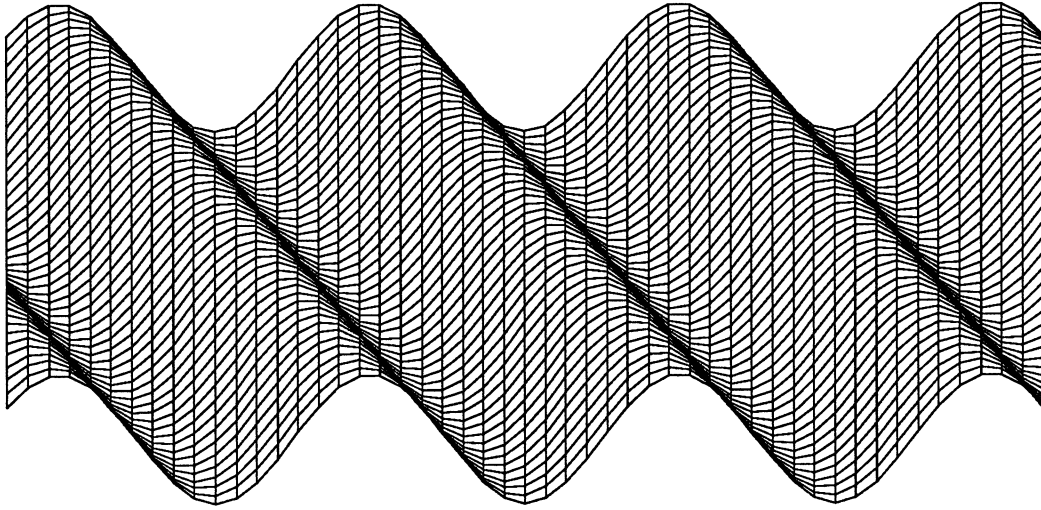
$$\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x,y) \delta(x - x_0, y - y_0) dx dy = f(x_0, y_0)$$



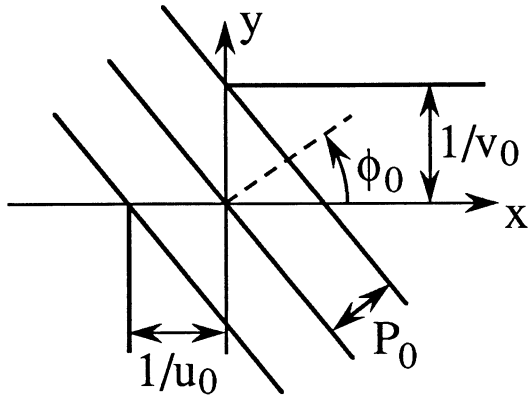
$$\Rightarrow f(x,y) \delta(x - x_0, y - y_0) = f(x_0, y_0) \delta(x - x_0, y - y_0)$$

$$\delta(ax - b, cy - d) = \frac{1}{|ac|} \delta(x - b/a, y - d/c)$$

Spatial Frequency Components



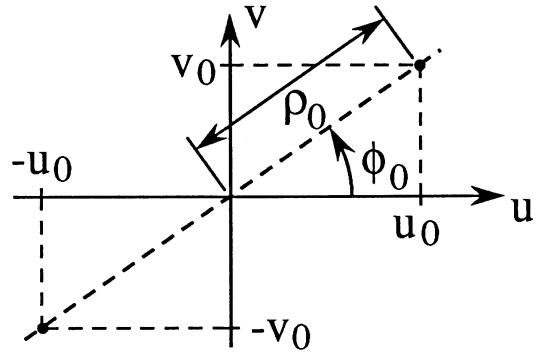
$$A \cos [2\pi(u_0x + v_0y) + \theta]$$



Spatial Domain

$$\rho_0 = \sqrt{u_0^2 + v_0^2}$$

$$= 1/P_0$$



Frequency Domain

$$\phi_0 = \arctan \left(\frac{v_0}{u_0} \right)$$