

Physics 471 Exam 5 Winter 2009 Bret Hess 422-2108

Closed book. No time limit. Student graphing calculators OK

CID _____

$$E = C \iint E(y, z) \frac{e^{ikr}}{r} dydz$$

For any transform pair: t, ω x, κ

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(\kappa) e^{-i\kappa x} d\kappa$$

$$F(\kappa) = \int_{-\infty}^{\infty} f(x) e^{i\kappa x} dx$$

$$\delta(x - x_0) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ik(x-x_0)} dk$$

$$\delta(\kappa - \kappa_0) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ix(\kappa - \kappa_0)} dx$$

$$\kappa = k \sin \theta \approx k \sin \theta \approx k \theta$$

$$(g * h)(u) = \int_{-\infty}^{\infty} g(u') h(u - u') du' \quad F\{(g * h)(t)\} = g(\omega) h(\omega) \quad F\{g(t)h(t)\} = \frac{1}{2\pi} g(\omega) * h(\omega)$$

$$I(\kappa) = \frac{I_{\text{peak}}}{N^2} \left| \frac{\sin\left(\frac{\kappa b}{2}\right)}{\frac{\kappa b}{2}} \right|^2 \frac{\sin^2\left(\frac{N\kappa a}{2}\right)}{\sin^2\left(\frac{\kappa a}{2}\right)}$$

$$I(\theta) = I_0 \left[\frac{J_1(\kappa D/2)}{\kappa D/2} \right]^2$$

$$\sum_{n=1}^N u^n = u \frac{u^N - 1}{u - 1}$$

$$V = \frac{I_{\text{max}} - I_{\text{min}}}{I_{\text{max}} + I_{\text{min}}}$$

$$I_{\text{det}}(\tau) = 2I_1 [1 + \gamma(\tau)] \quad \gamma(\tau) \equiv \frac{\int_{-\infty}^{\infty} d\omega I(\omega) e^{i\omega\tau}}{\int_{-\infty}^{\infty} I(\omega) d\omega} \quad |\gamma(a)| \equiv \left| \frac{\int_{-\infty}^{\infty} I(\theta') e^{-ika\theta'} d\theta'}{\int_{-\infty}^{\infty} I(\theta') d\theta'} \right|$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ T} \cdot \text{m}/\text{A}$$

$$c = 2.9979 \times 10^8 \text{ m/s}$$

$$q_e = 1.602 \times 10^{-19} \text{ C}$$

$$m_e = 9.108 \times 10^{-31} \text{ kg}$$

$$\kappa_B = 1.380 \times 10^{-23} \text{ J/K}$$

$$h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$\hbar = h/2\pi = 1.054 \times 10^{-34} \text{ J} \cdot \text{s}$$

$$\sigma = 5.670 \times 10^{-8} \text{ W/m}^2 \cdot \text{K}^4$$