

PHYS 2210 Fall 2010 Homework Set 12

Due at **9:30 AM** on **December 2nd, 2010**
Show your work!

1. (1 pt) Prove this orthogonality relation:

$$\begin{aligned}\int_{-\pi}^{\pi} \sin(mx)\sin(nx)dx &= 0 \text{ if } m \neq n \\ &= \pi \text{ if } m = n\end{aligned}$$

For full credit you must explicitly show the steps to evaluate the integral, and may not use a computer or integral table.

2. (1 pt) Find the Fourier Transform of a Gaussian, $f(x) = e^{-x^2/(2\sigma^2)}$, and show that it is also a Gaussian. (You will likely need to consult an integral table for this one.) What is the standard deviation of this transformed Gaussian?
3. (2 pt) Boas 7.12.12. Just find $g(\alpha)$. You don't have to plug back in and find $f(x)$.
4. (3 pt) Boas 13.2.2
5. (3pt) Boas 13.2.8