

# PHYS 301

## HOMEWORK #3

Due : 31 Jan. 2014

1. Find the Fourier coefficients and Fourier series for the function :

$$f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \sin x, & 0 < x < \pi \end{cases}$$

You may use Mathematica to compute integrals, but you must submit your output with your homework. Then use the series you compute to show that :

$$\sum_{n=2, \text{even}}^{\infty} 2/(n^2 - 1) = 1$$

where the sum is over all even values of n.

For problems 2 - 5, compute the values of the indicated expressions for integer values of n. You can end your computations when the pattern begins to repeat. (You may use *Mathematica* to verify your results, but you must do these calculations by hand.)

2.  $1 - \cos(n\pi/2)$

3.  $\cos(n\pi/4)$

4.  $\sin(n\pi/4) - 1$

5.  $\sin(n\pi/8)$

6. Show that  $\cos(iy) = \cosh y$  and  $\sin(iy) = i \sinh y$  where  $\cosh$  and  $\sinh$  are the hyperbolic functions.