PHYS 301 HOMEWORK #3

Due : 4 Feb. 2015

1. Refer to the Fourier series you derived for problem 3 on Homework #2. Use Dirichlet's Theorem to determine expressions for π (or π^2) by evaluating the series at x = 0, $\pi/2$ and π . For all the Fourier series below, find the Fourier coefficients and write out the first three non-zero terms of each trig series.

2. Find the Fourier series for f(x) = 1 + x on :

- a) 0 < x < 4
- b) 2 < x < 2
- 3. Find the Fourier series for f(x) = x on :
- a) $\pi < x < \pi$
- b) 3 < x < 3

4. Find the Fourier series for f (x) = $\begin{cases} -1, & -1 < x < 0 \\ 1, & 0 < x < 3 \end{cases}$

5. Use Mathematica to plot three full cycles of the Fourier series you derived for problem 4.

6. Write short Mathematica programs based on the following scenario : At the start of a ten year period (t = 0) you have \$1000 in a bank account which draws 4 % interest each year (so that your account accrues 1 % interest every 3 month period). At the end of each three month cycle, you deposit \$100 in your account. If you make no other deposits and no withdrawals, how much money will be in your account in 10 years? Write 3 programs to compute this value, one using a (or more) Do Loops, one using a For statement, and one using a While statement. (At the end of the three months, your initial \$1000 has earned \$10 in interest, and you then deposit \$100, so your amount after 3 months is \$1110 .00; after six months you have \$1221 .10)