

WORKSHEET FOR 4/13/2009

Reading assignment. Section V.1

Homework due Monday. p.604: 78, 79, 80, 81

Exercises:

- (1) (a) Show that  $|x| = \frac{\pi}{2} + \frac{1}{\pi} \sum_{m=0}^{\infty} \frac{-4}{(2m+1)^2} \cos((2m+1)x)$  (Hint:  $\int_{-\pi}^{\pi} |x| \cos(kx) dx = 2 \int_0^{\pi} x \cos(kx) dx$ , and  $\cos(k\pi) = (-1)^k$ ).
- (b) Use part (a) with  $x = 0$  to show that  $\frac{\pi^2}{8} = \sum_{m=0}^{\infty} \frac{1}{(2m+1)^2}$ .
- (c) Use part (a) with  $x = \pi$  to show the same result.
- (2) (a) Find the Fourier series for  $f(x) = x^2$ .
- (b) Use your answer from part (a) to show that  $\sum_{k=1}^{\infty} \frac{1}{k^2} = \frac{\pi^2}{6}$ .