MATH2100 Assignment 6
(= MATH2011 Assignment 1)

1. * Evaluate $\int x^2 \cos(\alpha x)\, dx$ and $\int x^2 \sin(\alpha x)\, dx$ using integration by parts. Sketch the function defined by

$$f(x) = 2x^2, \quad 0 \le x < 1\,;$$
$$f(x+1) = f(x), \quad -\infty < x < \infty\,,$$

and find its Fourier series expansion. By considering $f(x)$ and its Fourier series at $x = 0$, deduce that

$$\sum_{n=1}^{\infty} 1/n^2 = \pi^2/6\,.$$

2. * Sketch the odd and even periodic extensions of the function defined by $F(x) = 2x^2$ for $0 \le x < 1$, and find their Fourier sine and cosine series.

Practice problems:

Problem Set K11.2 pp.490 Numbers 2, 6, 8

Problem Set K11.3 p.496 Numbers 14, 20, 22

(No need for sketches - but try sketching with MATLAB if you like.)

Solutions to two starred problems to be handed in by 5pm on Monday, September 17 in appropriate box on Level 3, Mathematics Bldg 67.
NB: Use a cover sheet! (Download from www.maths.uq.edu.au/courses/MATH2100 /Tutorials/cover_sheet.pdf)