Math 454/554 Assignment 3

Due Thursday, 10/14

1) Compute

$$\int_0^\pi x \sin(nx)\ dx$$

for all natural numbers n. Use this to obtain the Fourier sine series of $f(x) = x$ on the interval $[0, \pi]$.

2) For all natural numbers m and all nonnegative integers n, show that

$$\int_0^\pi \sin(mx)\cos(nx)\ dx = \begin{cases} 0 & n = m \\ \frac{m(1-(-1)^{m+n})}{m^2-n^2} & n \neq m. \end{cases}$$

Conclude that the integral is only nonzero if the parity of n and m differs, i.e., one is odd and the other even.