SCIE 001 MATHEMATICS ASSIGNMENT 10 (Due 10:00 am Jan. 31, 2014)

There are two parts to this assignment. The first part is on WeBWorK and is due by 10:00 am on Fri. Jan. 31. The second part consists of the questions on this page. This assignment is due by 10:00 am on Fri. Jan. 31. For these questions, you are expected to provide full solutions with complete arguments and justifications. You will be graded on the correctness, clarity and elegance of your solutions. Your answers must be typeset or very neatly written. They must be stapled, with your name and student number at the top of each page.

1. (a) Prove the reduction formula

$$\int \cos^n x\,dx = \frac{1}{n}\cos^{n-1} x \sin x + \frac{n-1}{n}\int \cos^{n-2} x\,dx,$$

where $n \geq 2$ is an integer. *Hint:* First, work through Example 6 on p. 467.

(b) Use part (a) to evaluate

$$\int \cos^4 x\,dx.$$

2. Let $L > 0$ be a constant and let n be a constant positive integer. Evaluate

$$a_n = \frac{1}{L}\int_{-L}^{L} x^2 \cos\left(\frac{n\pi x}{L}\right)\,dx,$$

$$b_n = \frac{1}{L}\int_{-L}^{L} x^2 \sin\left(\frac{n\pi x}{L}\right)\,dx.$$

Hint: Use symmetry to simplify the calculations.