Homework for Math 43
Due Wednesday, May 22, 2002

1. Work problem 1 on page 226 (§64) in the text.

2. Evaluate
$$\int_{-\infty}^{\infty} \frac{\sin(\pi x)}{x^5 - 1}\, dx.$$

3. (This problem is not required — its in figurative parentheses!) Show that if $b > 0$ then
$$\int_0^{\infty} \frac{\sin(x)}{x(x^2 + b^2)}\, dx = \frac{\pi}{2b^2}(1 - e^{-b}).$$

4. Evaluate
$$\int_0^{\infty} \frac{\sin(ax)}{x(x^2 + b^2)^2}\, dx \quad (a, b > 0).$$

5. Evaluate
$$\int_0^{\infty} \frac{\sin^3(x)}{x^3}\, dx.$$

(Hint: Use de Moivre's Formula and remember that you need a simple pole to apply our lemma on indented contours.)