April 15, 2011

18.01 Problem Set 10
Due Wednesday, April 20, in recitation

Collaboration and discussion of problem sets is a good idea; you must write up your answers on your own, and you must answer question 0 of Part II.

Part I: 10 points

Notation for homework problems: "2.4/13" means Problem 13 at the end of section 2.4 in Simmons. "1A-3" means Exercise 1A-3 in Section E (Exercises) of the Supplementary Notes.

1. 5D-2, 3, 5, 7, 11, 13.
2. 5E-1, 3, 4, 10g.

Part II: 15 points

0. Write the names of all the people you consulted or with whom you collaborated and the resources you used, beyond the course text and notes and your instructors; or say "none" or "no consultation."

1) This problem is about

$$\int \frac{2xdx}{x^4+x^2+1}.$$

a) Compute the integral using first the "obvious" substitution $u = x^2$.

b) Factor the denominator as a product of two quadratic polynomials. (Hint: the factors have integer coefficients, so you can find them by a little bit of guessing.)

c) Compute the partial fraction expansion of the integrand, and use this to compute the integral.

d) Explain why your answer in (c) is the same as your answer in (a) (except perhaps an additive constant). (I'm looking for something better than "I didn't make a mistake in either calculation, so they must give the same answer.")