Homework Problems
Math 243 Honors, Fall 2014

12.1 : 2-4,6,7,9,11,13-15,17,19a,20,22,23,27,29,31,34,40-42
12.2 : 3-9,13,21,23,25,26,29,32,35,37-41,43,44
12.3: 11-13,17,19,23,25-28,33,38,41-43,45,47,48,54-58,60,63,64
12.4: 9-20,27-29,31,33-39,41,43-49,52(use 5 and 6 from Theorem 11), 53
12.5: 4,5,7,10-12,15,19-22,26, 27,31,33,35,37-41,43,45,48-51,53,57,58,61,63,65-68, 71-74,76-79, 69 and 70 (please do these two without using the formula).
12.6: 3,5,7,11-14,16,17,21,22,25-27,29-30,33,34,45,46,49 (optional),50

13.1: 9,11,12,17,19,21-30,39-43,47,48,50(optional)
13.2: 25,33,34,41,42
13.3: 3,4,7,9,11,12
13.4: 1,2,17-19,45

14.1: 15,19,25,27,29,30,32-34,36,37,43,49,59-64
14.2: No problems
14.3: 3,4,25,29,35,40,51,52,68,73,83
14.5: 5,9,12-16,23,25,27,29,31-35,39,43 (do questions 27,29,31-34 without using formulas) (optional 45,50,55)
14.6: 1-3,5,11,13,15,17,19,20,21,25-32,34,35,41,43,45,49,50,54,55,57,60,63,64a

15.1: 1a,3,5
15.3: 14,15,17,19,45-49,51,53,54,56,63,66
15.4: 5,6,13-18,29,31,32,38,40,41

1. Using polar coordinates, find the mass of a thin plate in the shape of the region common to the circles x^2 + (y-1)^2 = 1 and x^2 + y^2 = 1. The density at (x,y) is sqrt(x^2 + y^2). Hint: Draw a large sketch and draw your strips carefully. You may miss part of the region if you are not careful. Ans: 0.78959.
2. Find the area and the mass of a thin plate which is in the shape of the region bounded by the curves x+y=2, y=x^2, and x=2. The density at the point (x,y) is given to be xy. Ans: Area = 11/6, Mass=121/24.
3. Let D be the region inside one loop of r = 2cos(2 theta) which is also inside the circle r=1. Find the area and the mass of a thin plate in the shape D if the density at the point (x,y) is x^2 + y^2. Ans: Area = Pi/3 - sqrt(3)/4, Mass = Pi/3 -7sqrt(3)/16.

15.5: For these problems find only the mass - 8,10,13,16,25,26
15.7: 13,16,20,21,31-35,40(just mass),54,55a

Find the mass of the solid in the shape of the region bounded above by z=3-y, below by the x,y plane and on the sides by y=x^2 and y=2-x^2, density = z. In class I did this problem with the first strip parallel to the z axis. Do this problem two other ways with the first strip parallel to the y axis or the x axis. Verify that your answer is correct by using Mathematica for integration. *Mass = 592/105.*

15.8: 1,3,5-10,18,20,23,24,25a

15.9: 1-10,19,20,23,26,29a,30,35(volume only),36

15.10: 7-9,12,14,17,19,20,23,24,26, Q50 on page 1075 and these **optional** additional problems.

16.6: 19,22-25,29-31,33,35,36,39,42,45,46,49,61,64

16.7: 13,15-17,19,23,25,27,29(can you do this without integration),31,35,40,43

1. Let S be the boundary of solid bounded by z=x^2+y^2 and the plane z=2x+2y+2. Note that S is made up of two pieces
   (i) Find the surface area of S.
   (ii) Find the outward flux of F = xz **i** + z **j** + y **k** across S.
   Its solution.
2. Find the outward flux of F = <x,2y,3z> across the surface of the torus obtained by rotating the circle (y-5)^2 + z^2 = 1, x=0, around the z axis.

16.9: 7,10,11,17,24,25,26,27,31, and this problem (its solution).
(Q31 gives an interesting result when you take f=1. Interpret the result.)

14.8: 2,3,9,13,15-17,19-23, 31,34,36,42-46.

A. Find the largest and the smallest value of x^2 - y^2 over the region inside x^2+y^2=2y and above y=x.
B. Find the largest and the smallest value of x^2 - 8x + yz over the region enclosed by the surfaces x^2 - y^2 = 2 + z^2 and 3x + y + z=10.
   Its solution.

Questions 22,23 describe two situations where the method of Lagrange multipliers must be modified. In questions 34, 36, and 42 carefully consider whether the relevant pieces of the surfaces/curves also have edges.

14.7: 30,34,35,36.

These problems can be done with or without Lagrange Multiplies. Try doing them without using Lagrange Multipliers on the boundary; instead reduce to 1 dimensional problems on the boundary.