Review Guide and Practice Test 3rd Test Calc IV -- Test Wednesday March 31st Covered parts of Chatpers 13, 14

Section 13.8 Extreme Values – Finding ABSOLUTE max and min

- Given a function of two variables, calculate the critical points and determine which if any are relative and **absolute** maximums, minimums, or saddle points over a given region by using the second partials test and then testing along borders of the region.

Practice Problems: Exercises 53, 54 and Example 5

0. Find the absolute max and min of the function $f(x,y)=e^{x^2-y^2}$ over the region R = $\{(x,y)\mid x^2+y^2=1\}$

Section 13.10 Lagrange Multipliers

Using Lagrange Multipliers, set of the necessary equations and solve them to find the maximum or minimum of a function of two variables subject to one or two constraints.
Practice Problems: Exercises 5, 13, 15, 17, 19

1. Use Lagrange multipliers to minimize $f(x,y,z)=4x^2+y^2+z^2$ with the constraint that $2x-y+z=4$.

2. Set up the equations using the method of Lagrange Multipliers with two constraints:
Find the point on the intersection of the plane $x + 2y + z = 10$ and the paraboloid $z=x^2+y^2$ that is closest to the origin. (Recall that it is easier to minimize the square of the distance).

3. Set up the equations using the method of Lagrange Multipliers with two constraints (Do not solve – just write down the five equations that need to be solved):
Find the maximum value of $f(x,y,z)=x+2y+3z$ that is constrained to lie on the intersection of the plane $y + z = 1$ and the cylinder $x^2+y^2=2$.

Chapter 14

Section 14.1 Iterated Integrals, Area in Plane

Evaluate an iterated integral
Given a region in the plane, set up an iterated and evaluate an iterated integral to find the area of the region.
Given an iterated integral, sketch the region, and set up the integral with the order of integration reversed.
Practice Problems: Exercises 13, 29, 33, 61

4. a) Sketch the region R of integration represented by the integral $\int_{-1}^{1}\int_{0}^{1-x}(4-y)\,dy\,dx$.
   b) Write down what the iterated integral would be if the order of integration is reversed (do not need to evaluate).

5. Set up the iterated integral representing the area of the region R bounded by the graphs of $y=2x$ and $y=x^2$, using the order dy dx. (Do not need to evaluate).

Section 14.2 Double Integrals and Volume

Give the definition of a double integral as a limit of a Riemann sum and explain its interpretation in terms of the volume of a solid approximated by the sum of volumes of approximating rectangles.

Using Fubini's Theorem, solve problems to find volume setting up and evaluating the appropriate double integral.

Practice Problems: Exercises 13, 19, 23, 27, 49

6. Use a double integral to find the volume in the first octant under the surface $f(x, y) = x^2 y^2$, and above the region in the plane bounded the lines y = 1, y = 2, x = 0, and x = y

Sketch the region in the plane first.

7. Give the complete and precise definition of a double integral as a limit of a Riemann sum and explain its interpretation in terms of the volume of a solid approximated by the sum of volumes of approximating rectangular solids.

Section 14.3: Polar Coordinates

Explain how the formula for polar coordinate form for a double integral is developed using polar partitions and approximating sums.

Apply this formula (Theorem 14.3) to setting up and evaluating double integrals in polar form – including converting from rectangular to polar, and finding volume under a surface (or between two surfaces).

Practice Problems: Exercises 9, 11, 15, 27, 43, 44

8. Explain how the formula for polar coordinate form for a double integral is developed using polar partitions and approximating sums.

9. Use polar coordinates to evaluate $\iint_R \sqrt{x^2 + y^2}\, dA$ where the region R is region between the two circles $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.