MATH 241: FINAL EXAM REVIEW QUESTIONS

Miscellaneous Questions To Ask Yourself About Chapter 12

1. Where is the first octant in the $xyz-$coordinate system?
2. What is the distance formula between two points?
3. What is the formula for the length of a vector and what does this have to do with question 2?
4. Write down the unit vector going in the direction of $\overrightarrow{v} = \langle 4, -1, 8 \rangle$.
5. The dot product of two vectors is a _____ and the cross product of two vectors is a _____.
6. How do I compute the angle between 2 given vectors?
7. How do I compute the projection of a vector $\overrightarrow{a}$ onto a vector $\overrightarrow{b}$? What does this mean geometrically? What's the notation for the projection of $\overrightarrow{a}$ onto $\overrightarrow{b}$?
8. Do I know the formula for the length of a projection of a vector $\overrightarrow{a}$ onto a vector $\overrightarrow{b}$?
9. How do I find the area of a triangle formed by 3 given points in space?
10. How do I find the volume of a parallelepiped?
11. What do parametric equations for a line look like? What does the equation of a plane look like?
12. If I want the parametric equations for a line, I try to use the given information to find out what information about the line? Once the sought after information is known, what are the parametric equations?
13. What would be the corresponding questions for a plane in space? Answer them.
14. Remember spheres, cylinders, ellipsoids, paraboloids, cones, hyperboloids of one sheet, hyperboloids of two sheets, and hyperbolic paraboloids? Can I match approximate graphs of these with their equations?

Miscellaneous Questions To Ask Yourself About Chapter 13

1. Do I know what a vector valued function is?
2. Can I compute limits of vector valued functions?

3. Do I know how derivatives of vector valued functions are related to the graphs of vector valued functions?

4. Can I compute the arclength of a curve?

5. Can I compute unit tangent and unit normal vectors to a curve?

6. Am I prepared for velocity, speed and acceleration problems?

Miscellaneous Questions To Ask Yourself About Chapter 14

1. Can I compute $\lim_{(x,y)\to(0,0)} \dfrac{xy}{\sqrt{x^2+y^2}}$?

2. Can I compute $\lim_{h\to 0} \dfrac{\sin((x+h)y) - \sin(xy)}{h}$?

3. Do I really understand partial derivatives? What do they mean geometrically?

4. Now that I've reflected on the subject a bit, do I understand question 2?

5. Complete the rectangle to finish this sentence: To find the absolute maximum or the absolute minimum of a function $f(x,y)$ defined for all points (x,y) in the plane, it is a good idea to attempt to $\boxed{}$ a square.

6. What are the steps used to find the absolute maximum and the absolute minimum of a function $f(x,y)$ in some bounded region of the plane?

7. What are the steps used to find local maxima and local minima for a function $f(x,y)$?

8. Write down a few examples of the chain rule for functions of several variables. What is the molecular model approach? (Only anwer this question if you care to use that approach.)

9. How do I calculate the gradient of a function $f(x,y,z)$? Do I get a vector or a scalar? Should I get a vector or a scalar? Did I cheat myself by answering this last question, "Yes"?

10. What does the gradient mean geometrically?

11. What's the directional derivative of $f(x,y,z)$ and how do I compute it?

12. In what direction is the directional derivative maximized at a point?

13. Given a surface $f(x,y,z) = 0$ and a point P on the surface, what's the equation of the tangent plane to the given surface at P?

14. What is the second derivative test for calculating local maxima and local minima of a function? When am I stupid (i.e., when is it impossible to use the test)?

15. When can I be assured of having a saddle point using the second derivative test? What is a saddle point anyway?

Miscellaneous Questions To Ask Yourself About Chapter 15

1. Can I compute simple double integrals, or is it just the hard ones that I'm going to miss?
2. What do I try to do if a double integral looks too hard to compute and yet I'm required to compute it? What else can I try to do? What if the teacher doesn't allow cheating?
3. What is the integrand for computing a volume using a double integral? What is the integrand for computing a volume using a triple integral?
4. What is the integrand for computing an area using a double integral? What is the integrand for computing an area using a triple integral? Did that last question make sense?
5. Do I feel comfortable with setting up the limits of integration using rectangular coordinates?
6. Can I still draw simple graphs in polar coordinates?
7. Do I feel comfortable with setting up the limits of integration using polar coordinates? Do I feel comfortable with setting up the limits of integration using cylindrical coordinates?
8. Do I feel comfortable with setting up the limits of integration using spherical coordinates? Do I really understand the angle ϕ?
9. Can I convert between rectangular coordinates, cylindrical coordinates and spherical coordinates?
10. In polar coordinates, dA is replaced by what? In cylindrical coordinates dV is replaced by what?
11. In sherical coordinates, dV is replaced by what?
12. Given a triple integral $\int\int\int_T f(x,y,z)dV$ expressed in rectangular coordinates, it is sometimes easier to switch to cylindrical or spherical coordinates. What are good indications of when to switch and what to switch to?