Math 016 Final Exam Review May 8, 2006, Noon at C20 PC,
Table of integration will be provided. Instead of giving formulas on page 649 and up to equation 117 on page 655, I will give some useful formulas for the exam. If you don’t like this, please email me at lwang@math.uiowa.edu or talk to me. I will keep the old policy.
The least square formula and the formula for \( \Delta(x, y) \) will also be provided.

Important: You have to go over the review sheet for both of the midterms. The final is comprehensive.

1. Let \( z = x^3 - y^2 \). Find \( z_x(1, 2) \) and \( z_y(1, 2) \).
2. Let \( z = f(x, y) = \frac{1}{x+y+1} \). Find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \). What is \( \frac{\partial z}{\partial x}(1, 0) \)?
3. Find the tangent plane of the function \( z = f(x, y) = \frac{1}{x+y+1} \) at the point \((0, 0, 1)\).
4. Find the center of the mass of upper half unit disk.
5. Let \( z = x^y \). Find \( z_x(1, 2) \) and \( z_y(1, 2) \).
6. Let \( z = f(x, y) = \frac{1}{x+y+1} \). Find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \).
7. Find the tangent plane of \( e^x \sin(x + y) \) at \((0, 0, 0)\).
8. Let \( z = (x - y + 1)^2 \). Find \( z_x, z_{xy}, \frac{\partial^2 z}{\partial y^2} \).
9. Find the tangent plane of \((x - y + 1)^2 \) at \((0, 0, 1)\).
10. Find the critical points of \( x^2 - 4x^2y + y^2 \).
11. Determine if the critical points found in the previous problem is local maximum, minimal or a saddle?
    Formula on page 475 will be given in the test.
12. Find the line fit by the least square methods of the experimental data \((0, 0), (1, 1), (2, 1)\).
13. Find the line fit by the least square methods of the experimental data \((0, 0), (-1, 0), (2, 1)\).
14. Find the line fit by the least square methods of the experimental data \((0, 0), (-1, 1), (2, 2)\).
15. Suppose \( z = uv \) and \( u = e^{-x+y} \) and \( v = \sin(x + y) \). Find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \).
16. Let \( f(x, y) = \cos(x^2 + y^3) \). Find \( f_{xx} \).
17. Find the solution of differential equation \( \frac{dy}{dt} + 2y = 0 \) and \( y(1) = 1 \).
18. Find all the solutions of differential equation \( \frac{dy}{dt} = -2y \).
19. Find the solution of differential equation \( \frac{dy}{dt} = (2y + 1)y \) and \( y(1) = 2 \).
20. Find the solution of differential equation \( \frac{dy}{dt} = -2y + 1 \) and \( y(1) = 0 \).
21. Find the solutions of the differential equation \( \frac{dy}{dx} = e^{x+y} \).

22. Find the solutions of the differential equation \( \frac{dy}{dt} = \frac{y+1}{t} \).

23. Find the solutions of the differential equation \( \frac{dy}{dt} = (y + 1)y \).

24. Find the solutions of the differential equation \( \frac{dy}{dt} = y^2 + 1 \) and \( y(0) = 0 \).