**Math 2415 – Calculus III** ***Exam* 2 *Review***

*Professor*: Fred Khoury

1. Find partial derivatives of the function with respect to each variables

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1. Find second-order partial derivatives of the functions

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| --- | --- | --- |
|  |  |  |

1. Find  at *t* = 0 if 
2. Find  at *t* = 1 if 
3. Find  and  when  and  if 
4. Find the value of the derivative of  with respect to *t* on the curve  at 
5. Define *y* as a differentiable function of *x* for , find the values of  at point 
6. Find the direction in which  increases and decreases most rapidly at  and find the derivative of  in each direction. Also, find the derivative of  at  in the direction of the vector ***v***.
7. 
8. 
9. 
10. 
11. Find an equation for the plane tangent to the level surface  at the point . Also, find parametric equations for the line is normal to the surface at .
12. Find an equation for the plane tangent to the surface  at the point .
13. What is the largest value that the directional derivative of  can have at the point ?
14. You plan to calculate the volume inside a stretch of pipeline that is about 36 in. in diameter and 1 mile long. With which measurement should you be more careful, the length or the diameter? Why?
15. Find all the local maxima, local minima, and saddle points of the function
16. 
17. 
18. 
19. Find the extreme values of  on the circle 
20. Find the extreme values of  on the circle 
21. A closed rectangular box is to have volume . The cost of the material used in the box is a for top and bottom,  for front and back, and  for the remaining sides. What dimensions minimize the total cost of materials?
22. Find the extreme values of  on the curve of intersection of the right circular cylinder  and the hyperbolic cylinder .
23. Find the point closest to the origin on the curve of intersection of the plane  and the cone 

***Solution***

1.  





1. 





1. 
2. 
3. 
4. 
5. 
6.  







1. Tangent plane:  Normal line: 
2. Tangent plane: 
3. 
4. , the diameter has a greater effect on 
5. 





1. 
2. 
3. 
4. 



1. 