Seoul National University

The School of Electrical Engineering and Computer Sciences

Engineering Mathematics 2 Midterm Exam (2008 Spring)

     Name:                                         ID:

1 For +

 and 

1. Compute 
2. (5pts) By substitution & direct calculation.
3. (5pts) By the chain rule.
4. (10pts) By the chain rule





 since 



What is wrong with the above argument?

2 Given  and .

1. (5pts) Express the plane spanned by two vectors  and  in the form of on which  lies.
2. (5pts) Find a unit vector orthogonal to the vector  and .
3. (10pts) Show that the tangent plane to the surface  given by  at  is also spanned by  and .

3 Compute

1. (10pts) 
2. (10pts) the area of helicoid defined by 

with , , i.e. 

4 Evaluate

1. 

Where 

with  and

1. (5pts) 
2. (5pts) 
3. (10ts)  where  and the surface  is the portion of sphere  sitting on top of the circle

 as shown below ( It does not include the disk  in the xy-plane ) 

5 Using the Divergence Theorem, i.e.



and the mean value theorem for triple integrals, i.e.



For any continuous function  in a bounded and simply connected region  and some point  in  where  in Equation above is the volume of .

1. (20pts) Derive the formula

 = 

where 

and ,  and  are orthonormal vectors associated with spherical coordinates.



 ( Hint : Consider the differential volume whose sides are given by ,  and  )