1.

(a)

(i) 







(ii) 

 

 

(b) LHS is actually  while RHS is 

 In order for  to be equal to  either  i.e. 

or  i.e. 

but neither of which is true.

Thus,  is false.

2.

(a) =

= 

Since any vector passing through , i.e.  on the plane spanned by  and  is orthogonal to 



or



(b) 

(c) 

3.

(a) 

(b) since

 

4.

(a)

 (i) 

 (ii) 

(b) 

 where x=cost

 y=sint

 z=0

5.

Let f(x,y,z)=div

We obtain

 div(P)=

 where P : (x, y, z) any arbitrary point in T

 as T collapses to P

For the two faces orthogonal to the radial ρ direction, the surface integral is approximately

Fρ(ρ+dρ, φ, θ) · dA - Fρ(ρ, φ, θ) · dA

≈ Fρ(ρ+dρ, φ, θ) (ρ+dρ)2sinφdφdθ - Fρ(ρ, φ, θ)ρ2sinφdφdθ

≈ (Fρρ2sinφ)dρdφdθ

Dividing it by the volume given by ρ2sinφdρdφdθ

We obtain 