Lecture 32: Overview

1 We consider the following objects:

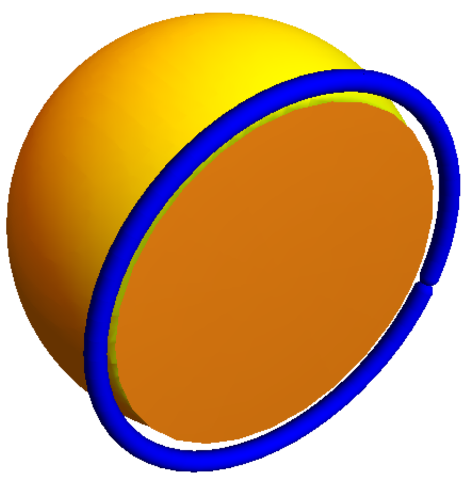
Assume $\vec{F} = [P, Q, R]$ is a vector field in space.

Let E be the solid upper half ball $z \geq 0, x^2 + y^2 + z^2 \leq 1$.

Let S be the upwards oriented half sphere $z > 0, x^2+y^2+z^2 = 1$

Let D be the upwards oriented disc $z = 0, x^2 + y^2 \leq 1$

Let C be the curve $\vec{r}(t) = [\cos(t), \sin(t), 0]$



2 Define the following integrals:

I) $\int\int\int_E \operatorname{div}(\vec{F})\, dV$

II) $\int\int_S \vec{F} \cdot d\vec{S}$

III) $\int_C \vec{F} \cdot \boxed{\text{dr}}$

IV) $\int\int_D \vec{F} \cdot d\vec{S}$

V) $\int\int_S \operatorname{curl}(\vec{F}) \cdot d\vec{S}$

VI) $\int\int_D \operatorname{curl}(\vec{F}) \cdot d\vec{S}$

3 Complete the following identities. You just have to fill in the signs $+$ or $-$ and give the name of the integral theorem, which justifies the identity:

a) I = $\square$ II + $\square$ IV by the $\square$ theorem

b) III = $\square$ V by the $\square$ theorem

c) III = $\square$ VI by the $\square$ theorem