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) \[ \int \int \int_E \text{div}(\vec{F}) \, dV \]

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

III) \[ \int_C \vec{F} \cdot d\vec{r} \]

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

V) \[ \int \int_S \text{curl}(\vec{F}) \cdot d\vec{S} \]

VI) \[ \int \int_D \text{curl}(\vec{F}) \cdot d\vec{S} \]

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 \hspace{0.5cm} \text{by the} \hspace{0.5cm} \text{theorem}

b) III = \[ 
\square \] V \hspace{0.5cm} \text{by the} \hspace{0.5cm} \text{theorem}

c) III = \[ 
\square \] VI \hspace{0.5cm} \text{by the} \hspace{0.5cm} \text{theorem}