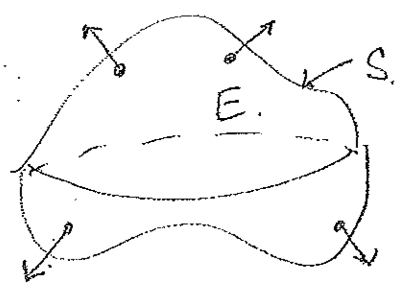
(6). (N23: Divergence thm

Divergence thm. Let E be a solid region, & let S be the boundary surface of E, given w/ positive (outward) orientation. Suppose the components of the vector field $\underline{F}$ have continuous 1st partial derivatives on an open region containing E.




then $$\iint_S \underline{F} \cdot d\underline{S} = \iiint_E \underline{\nabla} \cdot \underline{F} \, dV$$

Div thm, 2

Divergence thm: $\iint_S \rho \underline{v} \cdot \underline{n}\, dS = \iiint_E \underline{\nabla} \cdot \rho \underline{v}\, dV$

$= \iiint_E \underline{\nabla} \cdot [(1200)(y, 1, z)]\, dV$

$= \iiint_E (0 + 0 + 1)\, dV$

$= 1200 \iint_D \int_0^{9-\frac{1}{4}(x^2+y^2)} dz\, dA = 1200 \iint_D z \Big|_{z=0}^{z=9-\frac{1}{4}(x^2+y^2)}$

$= 1200 \int_0^{2\pi} \int_0^6 \left(9 - \frac{1}{4}\cancel{(x^2+y^2)}^{\,r^2}\right) \cancel{dA}\; r\, dr\, d\theta$

$= 1200 \cdot 2\pi \left[ \frac{9r^2}{2} - \frac{1}{4}\frac{r^4}{4} \right]_0^6$ as before

$= \cdots = 194{,}400\pi$

ce1

10. Evaluate $\int_\Gamma \bar{z}\, dz$, where $\Gamma$ is the contour $|z| = 2$, traversed in the counterclockwise direction.

Name: ______________________



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