10. WE WRITE $\iint_{\partial E} \underline{F} \cdot d\underline{S} = \iiint_E \operatorname{div}(\underline{F})\, dV$, WHERE

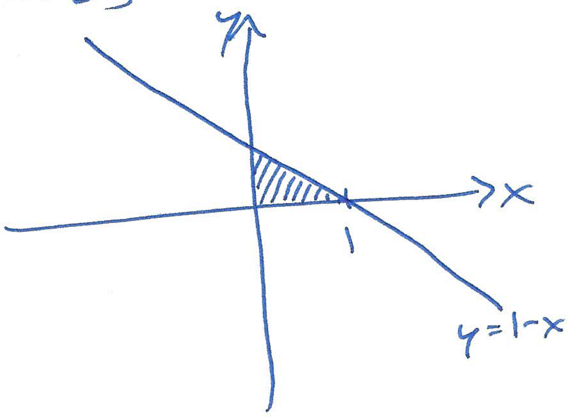
$$\operatorname{div}(\underline{F}) = 2 + 0 + (-1) = 1$$

THUS $\iint_{\partial E} \underline{F} \cdot d\underline{S} = \iiint_E dV$.

WE HAVE $0 \le z \le 1 - x - y$.

IN THE xy-PLANE, $x + y + z = 1$ BECOMES

$$x + y = 1$$
$$y = 1 - x$$



SO WE ALSO HAVE $0 \le y \le 1 - x$

$$0 \le x \le 1$$

THUS
$$\iiint_E dV = \int_0^1 \int_0^{1-x} \int_0^{1-x-y} dz\, dy\, dx$$
$$= \int_0^1 \int_0^{1-x} \left[z \right]_{z=0}^{z=1-x-y} dy\, dx$$
$$= \int_0^1 \int_0^{1-x} (1 - x - y)\, dy\, dx$$
$$= \int_0^1 \left[y - xy - \tfrac{1}{2} y^2 \right]_{y=0}^{y=1-x} dx$$
$$= \int_0^1 \left[(1-x) - x(1-x) - \tfrac{1}{2}(1-x)^2 \right] dx$$
$$= \int_0^1 \left(1 - x - x + x^2 - \tfrac{1}{2} + x - \tfrac{1}{2}x^2 \right) dx$$
$$= \int_0^1 \left(\tfrac{1}{2}x^2 - x + \tfrac{1}{2} \right) dx$$
$$= \left[\tfrac{1}{6}x^3 - \tfrac{1}{2}x^2 + \tfrac{1}{2}x \right]_0^1 = \tfrac{1}{6} - \tfrac{1}{2} + \tfrac{1}{2} = \boxed{\tfrac{1}{6}}$$