* Return HW and review.

* Stokes' theorem example

$$\varphi : [0,1]^2 \longrightarrow \mathbb{R}^3$$
$$(u,v) \longmapsto (u, v, u^2+v^2)$$

$$w = -y\,dx + x\,dy + z\,dz$$

$$\int_\varphi dw$$

$$dw = -dy\wedge dx + dx\wedge dy + dz\wedge dz = 2\,dx\wedge dy.$$

$$\int_\varphi dw = \int_\varphi 2\,dx\wedge dy = \int_{[0,1]^2} \varphi^*(2\,dx\wedge dy)$$

$$= \int_{[0,1]^2} 2\,du\wedge dv = \int_{[0,1]^2} 2 = 2.$$

$$\int_{\partial Q} w \qquad\qquad w = -y\,dx + x\,dy + z\,dz$$

$$Q\circ\Delta^2_{1,0}(t) = Q(0,t) = (0,t,t^2)\,, \qquad Q\circ\Delta^2_{1,1}(t) = Q(1,t) = (1,t,1+t^2)$$

$$Q\circ\Delta^2_{2,0}(t) = Q(t,0) = (t,0,t^2)\,, \qquad Q\circ\Delta^2_{2,1}(t) = Q(t,1) = (t,1,t^2+1)$$

$$\int_{\partial Q} w = -\int_{Q\circ\Delta^2_{1,0}} w + \int_{Q\circ\Delta^2_{1,1}} w + \int_{Q\circ\Delta^2_{2,0}} w - \int_{Q\circ\Delta^2_{2,1}} w$$

$$= -\int_{[0,1]}(Q\circ\Delta^2_{1,0})^* w + \int_{[0,1]}(Q\circ\Delta^2_{1,1})^* w + \int_{[0,1]}(Q\circ\Delta^2_{2,0})^* w - \int_{[0,1]}(Q\circ\Delta^2_{2,1})^* w$$

$$= -\int_{[0,1]} -t\,d0 + 0\,dt + t^2\,dt^2 + \int_{[0,1]} -t\,d1 + 1\,dt + (1+t^2)\,d(1+t^2) + \int_{[0,1]} t^2\,dt^2 - \int_{[0,1]} -dt + (t^2+1)\,d(t^2+1)$$

cancel

$$= -\int_{[0,1]} 2t^3\,dt + \int_{[0,1]} 1 + (1+t^2)2t\,dt + \int_{[0,1]} 2t^3\,dt - \int_{[0,1]} -1 + (t^2+1)2t\,dt$$

$$= \int_{[0,1]} 2\,dt = 2.$$

□

cancel