2nd Major Use of Stokes Theorem [Modified]

- similar to the original "2nd use," except now we notice that the divergence/curl need not be zero.

- can be used to turn a difficult problem into several easier problems if the div/curl of the function is simple and the region is nice.

Explication of Curl and Div:

- Curl represents the degree to which a vector field tends to make a "vortex" at a point...that is the degree to which it tends to go in a circle.

- To measure curl qualitatively, you can think of putting a paddle-wheel in the field and seeing to what degree the paddle-wheel spins.

- Divergence is the measure of how much a field is spreading out at a point.

Why are these theorems true?

In class we only discussed why the divergence theorem is true. Essentially if you consider the infinitesimal flow out of that point, the flow can be broken up into flow that goes into other points and flow that goes out the figure. Since the flow that goes into the other points will be considered as negative flow into them, if we wish to find the total flow out of the entire object we can add up the infinitesimal flow out of all the points....that is:

$$\mathbf{Flux}_{Surface} = \mathbf{Sum} \quad \mathbf{of} \quad \mathbf{flows}_{volume} \rightarrow$$

$$\iint_{\partial V} \mathbf{F} \cdot \mathbf{dS} = \iiint_{V} \nabla \cdot \mathbf{F} dV$$