Nov 16 Worksheet

0.1. **Computing Curl.** Compute the curl of the vector field $\vec{F} = \langle -y, x, 1 \rangle$. Is this vector field conservative? Give a geometric interpretation to the curl vector field.

0.2. **Warming up to Stokes Theorem.** Compute the work done by the vector field $\vec{F} = \langle -y, x, 0 \rangle$ on the curve parameterized by $\vec{r}(t) = \langle \cos t, \sin t, 0 \rangle$ by:

- Computing the work of $\vec{F}$ on $\vec{r}(t)$ by hand.

- Computing the curl of $\vec{F}$, and applying Stoke's theorem over the disk parametrized by
$$\vec{r}(u, v) = \langle u \cos v, u \sin v, 0 \rangle$$

0.3. **Concept: Stoke's Theorem.** This one is a bit tricker, so I would work on it last. Consider the vector field from before,

$$\vec{F} = \langle -y, x, 0 \rangle.$$

Let S be any surface with boundary curve C on the xy-plane. Show that the flux of $\vec{F}$ through C is equal to the area bounded by the curve C in the xy-plane.

0.4. **Concept: Identify Which Theorem To use?** For each of the following problems, identify whether you want to use: FTOLI, Greens, Greens II, Stokes Thm or Divergence Theorem.

- Find the work done on a closed curve by the vector field $\langle x, y \rangle$.
- Find the flux of a divergence-free vector field through a surface with boundary.
- Find the flux of a vector field through a closed surface.
- Find the flux of a vector field through a closed curve in the plane.
- Find the work done on a closed curve by a conservative vector field.