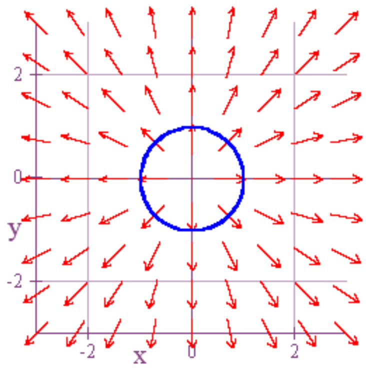
GREEN'S THEOREM AND STOKES' THEOREM

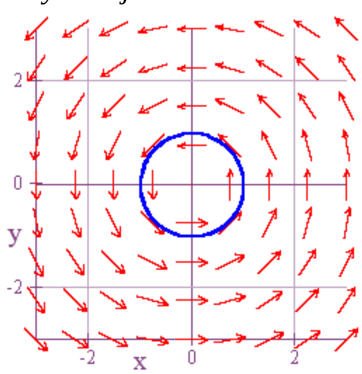
Use Green's Theorem (which in 2-dimensions is the same as Stokes' Theorem),

$Circulation = \int_C \vec{F} \bullet d\vec{r} = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dA = \iint_R \left(\nabla \times \vec{F} \right) \bullet \hat{k}\, dA$, to measure the circulation around the boundary of the unit circle (oriented counterclockwise) caused by each of the following vector fields.

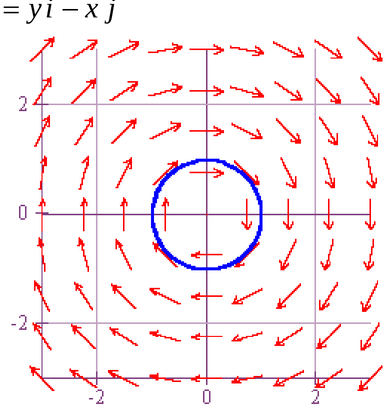
1. $\vec{F} = x\hat{i} + y\,\hat{j}$



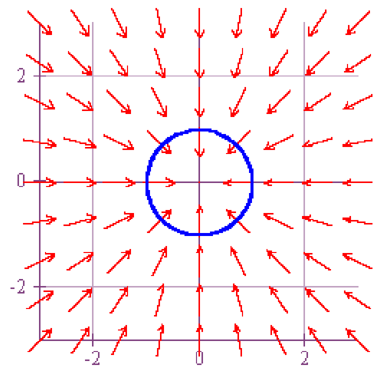
2. $\vec{F} = -y\hat{i} + x\,\hat{j}$



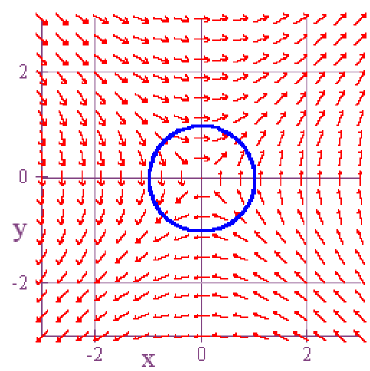
3. $\vec{F} = y\hat{i} - x\,\hat{j}$



4. $\vec{F} = -x\hat{i} - y\,\hat{j}$



5. $\vec{F} = y\hat{i} + x\,\hat{j}$



6. $\vec{F} = 4x\hat{i} - 3y\,\hat{j}$