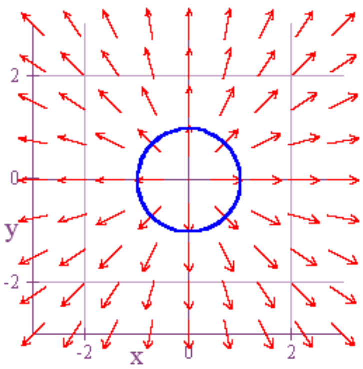
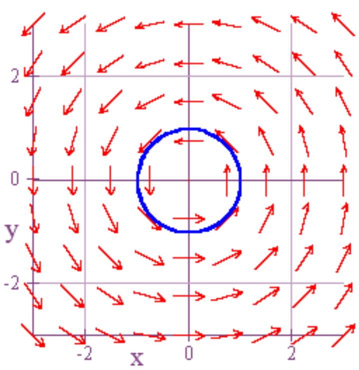
THE DIVERGENCE THEOREM

Use the Divergence Theorem (Gauss' Theorem), $Flux = \int_C \vec{F} \bullet N\, ds = \iint_R \nabla \bullet \vec{F}\, dA$, to measure the flux across the boundary of the unit circle (oriented counterclockwise) caused by each of the following vector fields.

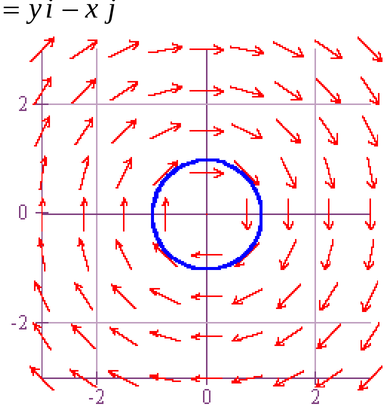
1. $\vec{F} = x\hat{i} + y\hat{j}$



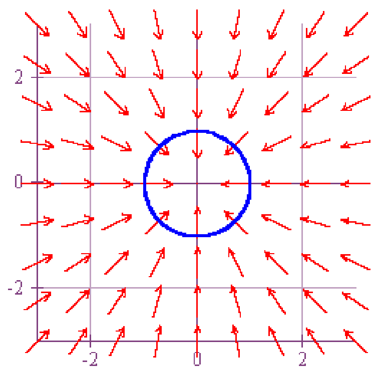
2. $\vec{F} = -y\hat{i} + x\hat{j}$



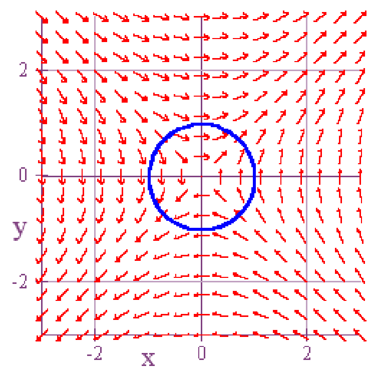
3. $\vec{F} = y\hat{i} - x\hat{j}$



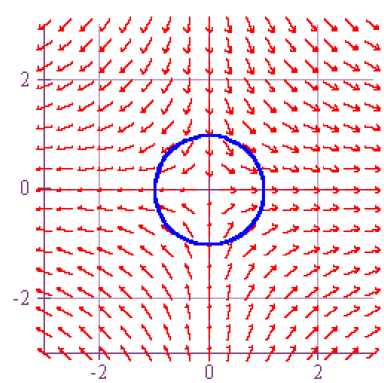
4. $\vec{F} = -x\hat{i} - y\hat{j}$



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



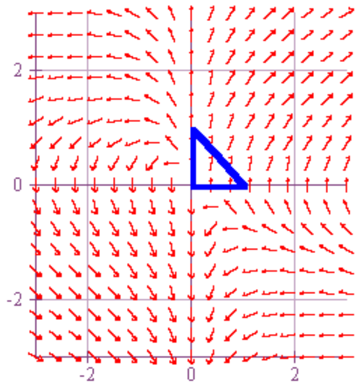
6. $\vec{F} = 4x\hat{i} - 3y\hat{j}$



7. $\vec{F} = xy\hat{i} + (x+y)\hat{j}$

R is a triangular region defined by $0 \le x \le 1$ and $0 \le y \le -x+1$, and R is oriented counterclockwise.

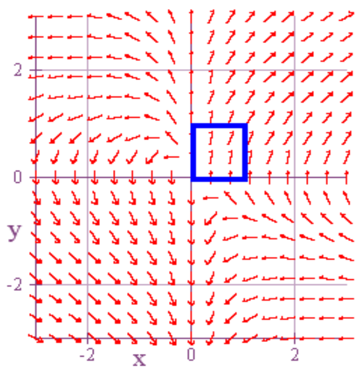
Use the Divergence Theorem to find the flux across the curve created by the vector field $\vec{F}$.



8. $\vec{F} = xy\hat{i} + (x+y)\hat{j}$

R is a square region defined by $0 \le x \le 1$ and $0 \le y \le 1$, and R is oriented counterclockwise.

Use the Divergence Theorem to find the flux across the curve created by the vector field $\vec{F}$.



9. $\vec{F} = xy\hat{i} + (x+y)\hat{j}$

R is the unit circle, and R is oriented counterclockwise.

Use the Divergence Theorem to find the flux across the curve created by the vector field $\vec{F}$.