MTH 255H **HW #3** Winter 2019

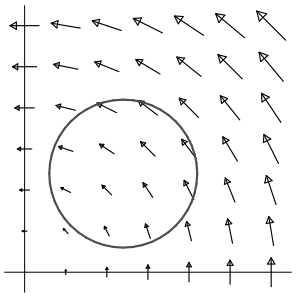
1. Sketch each of the vector fields below

(a) $\vec{\boldsymbol{G}} = x\,\hat{\boldsymbol{x}} + y\,\hat{\boldsymbol{y}}$

(b) $\vec{\boldsymbol{H}} = y\,\hat{\boldsymbol{x}} - x\,\hat{\boldsymbol{y}}$

(c) $\vec{\boldsymbol{F}} = y\,\hat{\boldsymbol{x}} + x\,\hat{\boldsymbol{y}}$

2. Consider the vector field $\vec{\boldsymbol{F}}$ shown at the right. Which of the following formulas best fits $\vec{\boldsymbol{F}}$? Why?

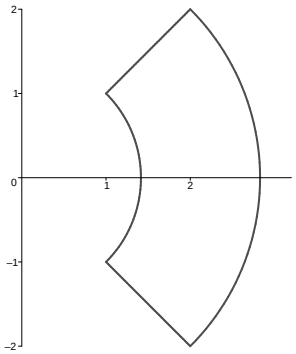


(a) $\vec{\boldsymbol{F}}_1 = \dfrac{x}{x^2+y^2}\,\hat{\boldsymbol{x}} + \dfrac{y}{x^2+y^2}\,\hat{\boldsymbol{y}}$

(b) $\vec{\boldsymbol{F}}_2 = -y\,\hat{\boldsymbol{x}} + x\,\hat{\boldsymbol{y}}$

(c) $\vec{\boldsymbol{F}}_3 = \dfrac{-y}{(x^2+y^2)^2}\,\hat{\boldsymbol{x}} + \dfrac{x}{(x^2+y^2)^2}\,\hat{\boldsymbol{y}}$

3. For each of the vector fields below, explain whether you expect the given vector field to have positive, negative, or zero circulation *counterclockwise* around the closed curve C in the figure shown at the right. Two of the segments of C are circular arcs centered at the origin; the other two are radial line segments. You may find it helpful to sketch the vector field.



(a) $\vec{\boldsymbol{G}} = x\,\hat{\boldsymbol{x}} + y\,\hat{\boldsymbol{y}}$

(b) $\vec{\boldsymbol{H}} = y\,\hat{\boldsymbol{x}} - x\,\hat{\boldsymbol{y}}$