MTH 255 **HW #4** Winter 2003

Skills check (not to turn in):

(a) §16.1: 3, 11, 13, 15, 17

(b) §16.2: 3, 17

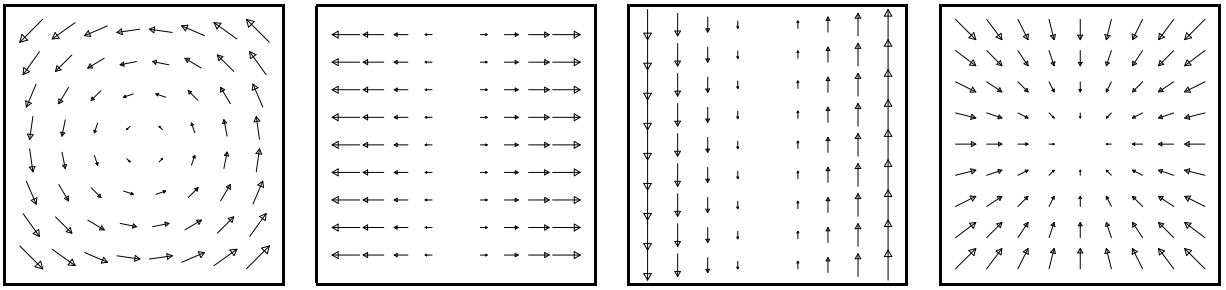
(c) Let C be the ellipse parameterized by $x = 3\cos\phi$, $y = 4\sin\phi$, $\phi \in [0, 2\pi]$. Evaluate the line integral $\int_C \vec{\boldsymbol{F}} \cdot d\vec{\boldsymbol{r}}$, where $\vec{\boldsymbol{F}} = -y\,\hat{\boldsymbol{\imath}} + x\,\hat{\boldsymbol{\jmath}}$.

Assigned:

1.

(a) For each vector field $\vec{\boldsymbol{F}}$ shown below, sketch a curve for which the integral $\int_C \vec{\boldsymbol{F}} \cdot d\vec{\boldsymbol{r}}$ is positive.

(b) For which of these vector fields is it possible to choose your curve to be closed?



2. Evaluate $\int_C \vec{\boldsymbol{F}} \cdot d\vec{\boldsymbol{r}}$ for the vector field $\vec{\boldsymbol{F}} = y\,\hat{\boldsymbol{\imath}} - x\,\hat{\boldsymbol{\jmath}}$ along the right-hand-side of the unit circle, starting at $(0, 1)$.

3. A helix with 17 turns has height H and radius R. Charge is distributed on the helix so that the linear charge density increases like the square of the distance up the helix. At the bottom of the helix the linear charge density is 0 Coulombs/meter. At the top of the helix, the linear charge density is 13 Coulombs/meter. What is the total charge on the helix?