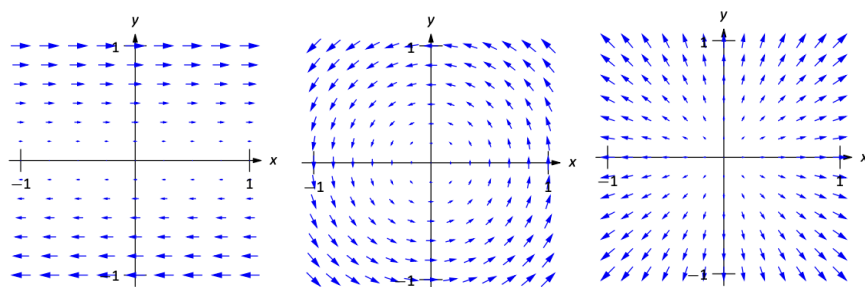# Math 203 — Vector fields

Problem 1. Sketch the following vector fields by hand and then check your work in CalcPlot3d.

    a. $\mathbf{F}(x, y) = \langle x, 0\rangle$

    b. $\mathbf{F}(x, y) = \langle y, x\rangle$

    c. $\mathbf{F}(x, y) = \langle 0, y\rangle$

Problem 2. Match each of the following vector fields with their plots shown below and then trace in an example flow line that starts in the second quadrant.

    a. $\mathbf{F}(x, y) = \langle x, y\rangle$

    b. $\mathbf{F}(x, y) = \langle -y, x\rangle$

    c. $\mathbf{F}(x, y) = \langle y, 0\rangle$

Problem 3. Match the three vector fields in the previous problem with the corresponding flow lines.

    a. $\mathbf{r}_1(t) = \langle ae^t, be^t\rangle$

    b. $\mathbf{r}_2(t) = \langle a\cos t, a\sin t\rangle$

    c. $\mathbf{r}_3(t) = \langle at + b, a\rangle$

Problem 4. Pair each contour plot for a function f with the vector field $\mathbf{F}$ so that $\mathbf{F} = \nabla f$. These vector fields are called **gradient vector fields** and the functions f are called **potential functions**.