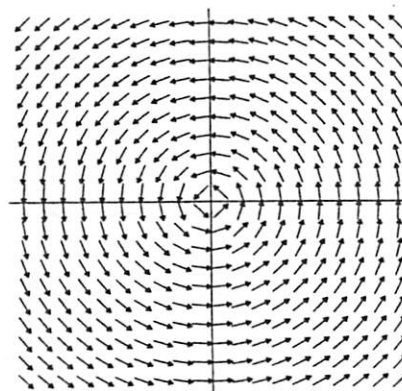
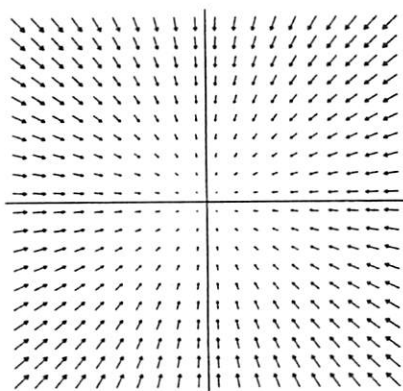
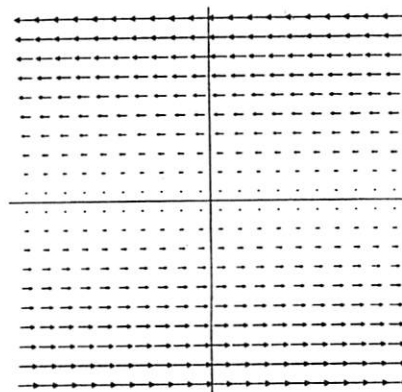
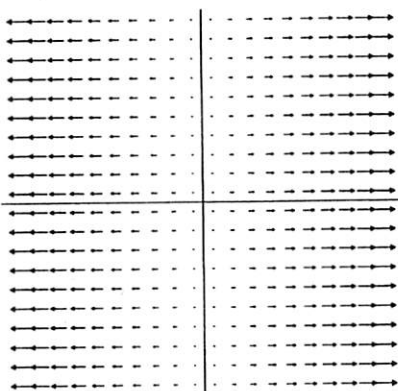


## Worksheet 17.3: Vector Fields

1. Find possible formulas for the four vector fields pictured below. (There are many possible answers.)



2. Newton's Law of Gravitation states that the magnitude of the gravitational force exerted by an object of mass  $M$  on an object of mass  $m$  is directly proportional to  $M$  and  $m$  and inversely proportional to the square of the distance between them. The direction of the force is from  $m$  to  $M$  along the line connecting them. Find a formula for the vector field  $\vec{F}(\vec{r})$  that represents the gravitational force, assuming  $M$  is located at the origin and  $m$  is located at the point with position vector  $\vec{r}$ .

Sketch the gradient vector field for the functions described by the following level curve diagrams. Pay close attention to the directions of the vectors and their lengths relative to one another.

$$\vec{F}(x, y) = \nabla f(x, y).$$

3. For a function  $z = f(x, y)$ , the set of gradient vectors forms a vector field, that is,

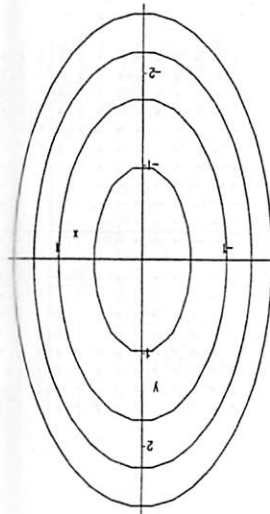


Figure 17.3.2: Contours have values 1, 2, 3, 4, starting at the inside

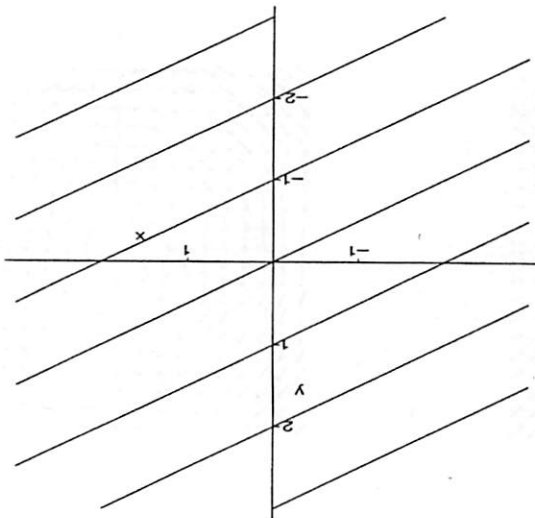


Figure 17.3.3: Contours have values 1, 2, 3, 4, 5, 6, 7, top to bottom