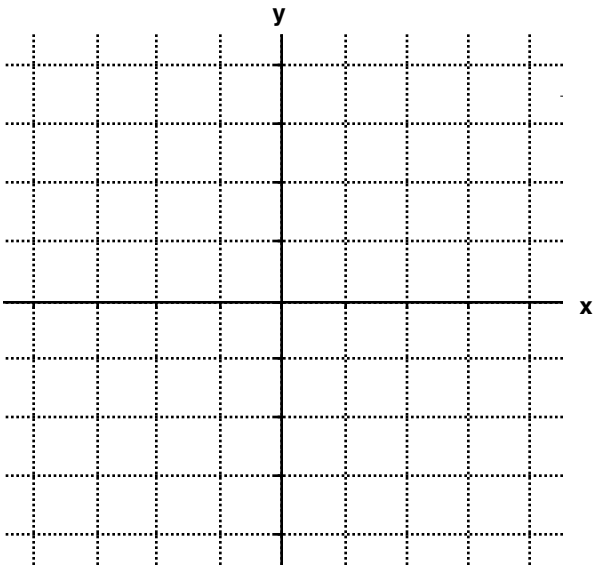
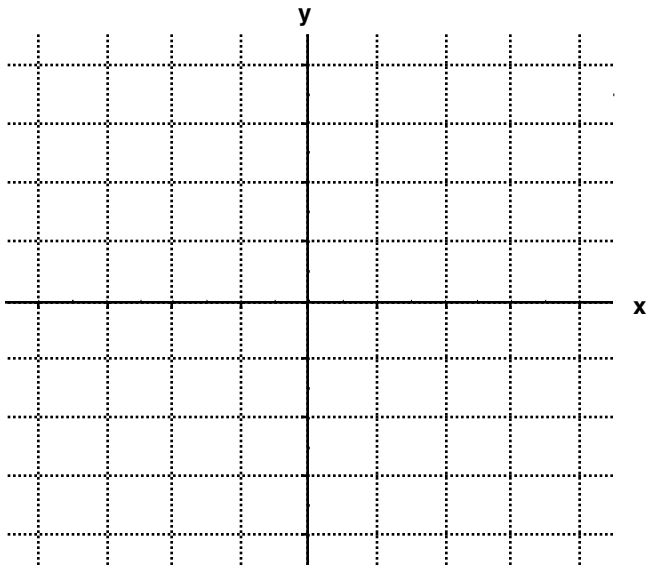
Math 213 Class 13: Vector Fields: Sketch each of the following vector fields.

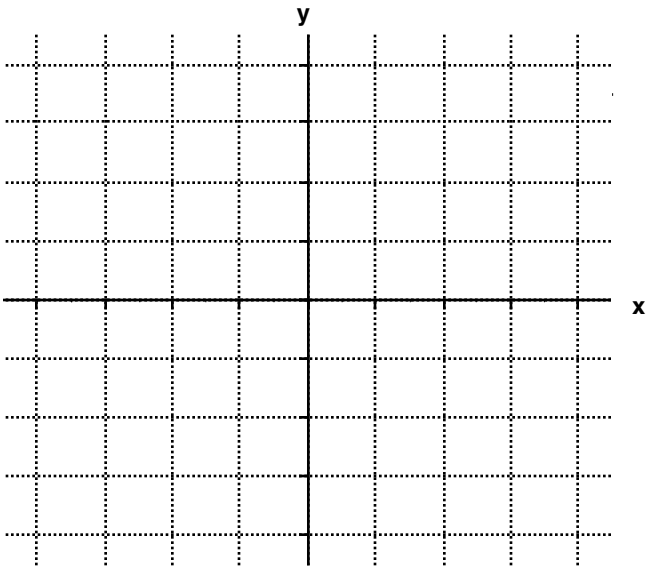
$\mathbf{F}(x,y) = xy\,\mathbf{i} + 0\,\mathbf{j}$



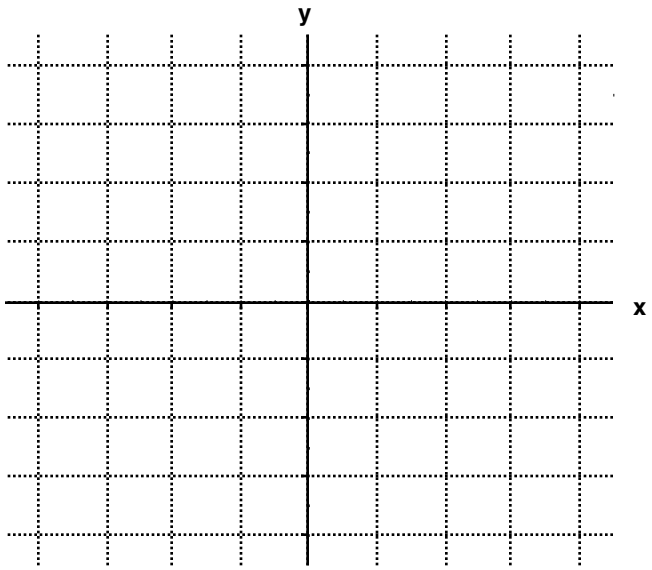
$\mathbf{F}(x,y) = y\,\mathbf{i} - x\,\mathbf{j}$



$\mathbf{F}(x,y) = x\,\mathbf{i} + y\,\mathbf{j}$

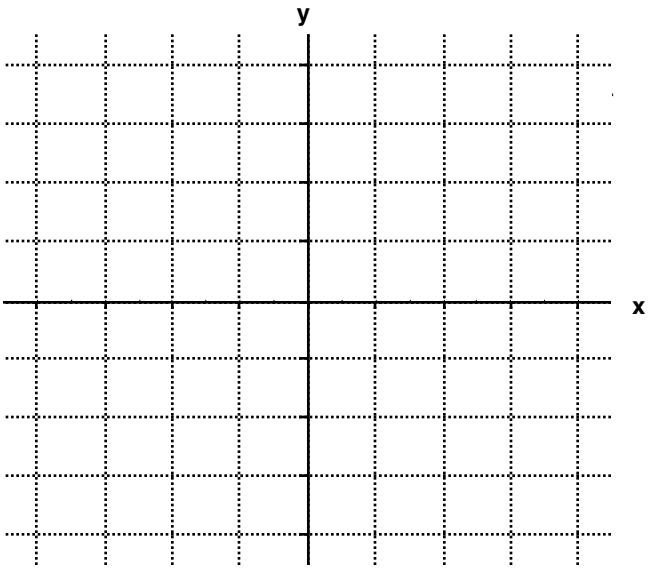


$\mathbf{F}(x,y) = 2\,\mathbf{i}$

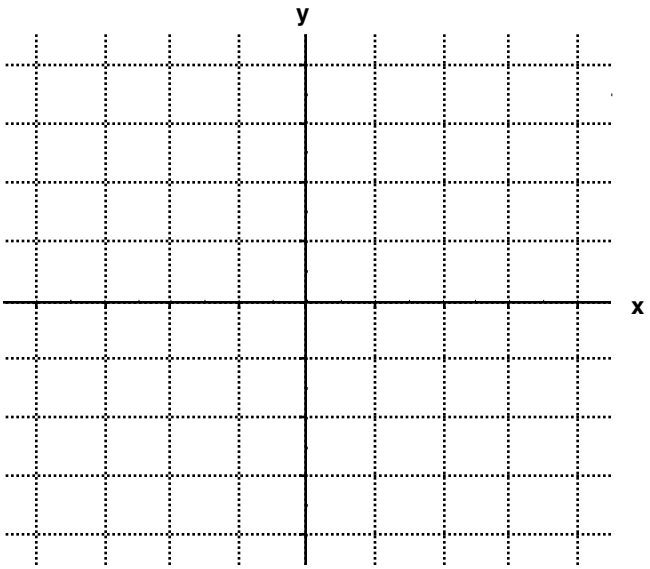


Math 213 Class 13: Vector Fields: Sketch each of the following vector fields.

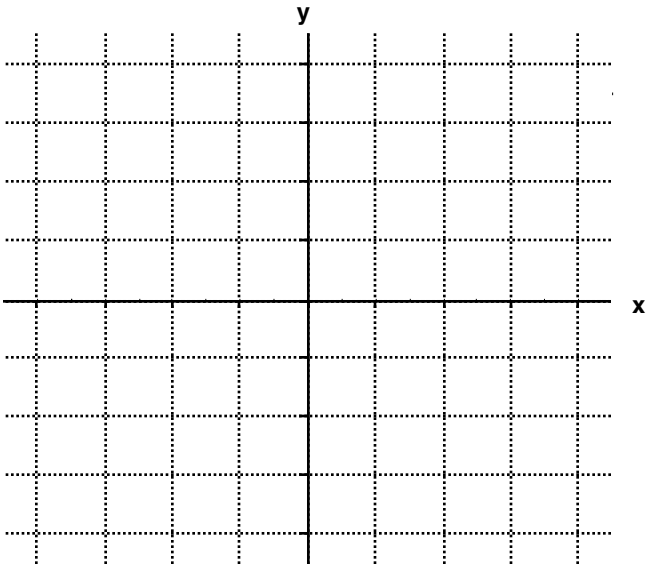
$\mathbf{F}(x,y) = 2\,\mathbf{i} + 3\,\mathbf{j}$



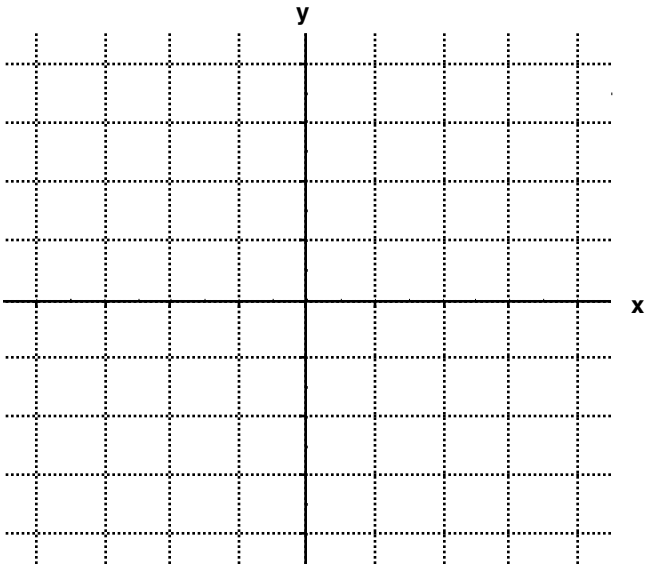
$\mathbf{F}(x,y) = x\,\mathbf{i}$



$\mathbf{F}(x,y) = 2\,\mathbf{i} + x\,\mathbf{j}$



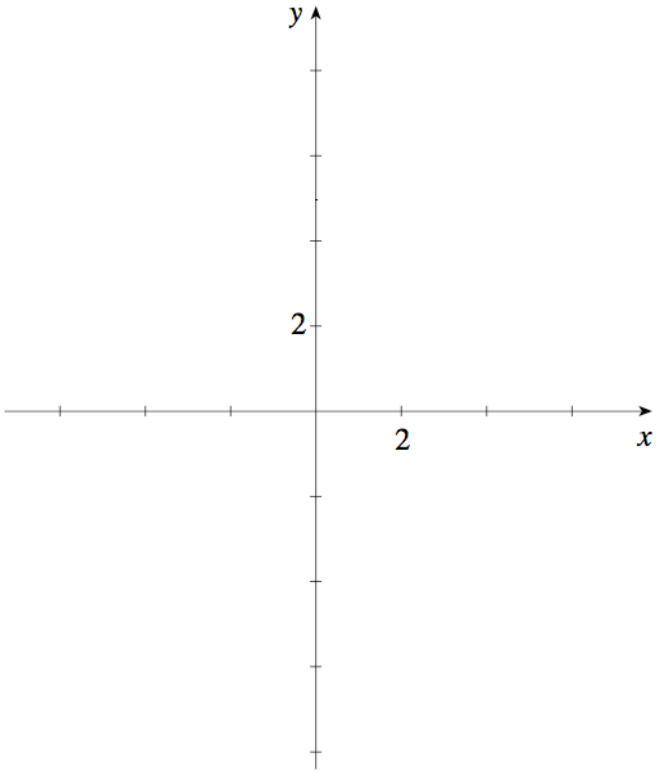
$\mathbf{F}(x,y) = -x\,\mathbf{j}$



Math 213 Class 13: Gradient Fields and Level Curves

1. Let $f(x,y) = \frac{x^2}{4} + \frac{y^2}{9}$.

   Draw level curves $f(x,y) = k$ for $k = 1,2,4$ on the axes below. Then compute the gradient vector field and sketch it at one or two points on each level curve.



Math 213 Class 13: Gradient Fields and Level Curves

Finding the Gradient Fields

The following vector fields are conservative. For each one, find a function $f(x,y)$ or $f(x,y,z)$ for which it is a gradient field.

1. $\mathbf{F}(x,y) = 3xy^2\,\mathbf{i} + 3x^2y\,\mathbf{j}$

2. $\mathbf{F}(x,y) = y\sin(xy)\,\mathbf{i} + x\sin(xy)\,\mathbf{j}$

3. $\mathbf{F}(x,y) = (2x+y)\,\mathbf{i} + \left(x+3y^2\right)\mathbf{j}$

4. $\mathbf{F}(x,y,z) = yze^{xyz}\,\mathbf{i} + xze^{xyz}\,\mathbf{j} + xye^{xyz}\,\mathbf{k}$