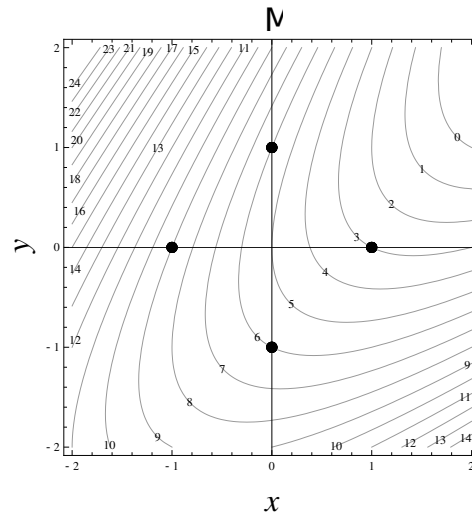


# 1 Contours

Shown below is a contour plot of a scalar field,  $\mu(x, y)$ . Assume that  $x$  and  $y$  are measured in meters and that  $\mu$  is measured in kilograms. Four points are indicated on the plot.



- Determine  $\frac{\partial \mu}{\partial x}$  and  $\frac{\partial \mu}{\partial y}$  at each of the four points.
- On a printout of the figure, draw a qualitatively accurate vector at each point corresponding to the gradient of  $\mu(x, y)$  using your answers to part a above. How did you choose a scale for your vectors? Describe how the direction of the gradient vector is related to the contours on the plot and what property of the contour map is related to the magnitude of the gradient vector.
- Evaluate the gradient of  $h(x, y) = (x + 1)^2 \left(\frac{x}{2} - \frac{y}{3}\right)^3$  at the point  $(x, y) = (3, -2)$ .