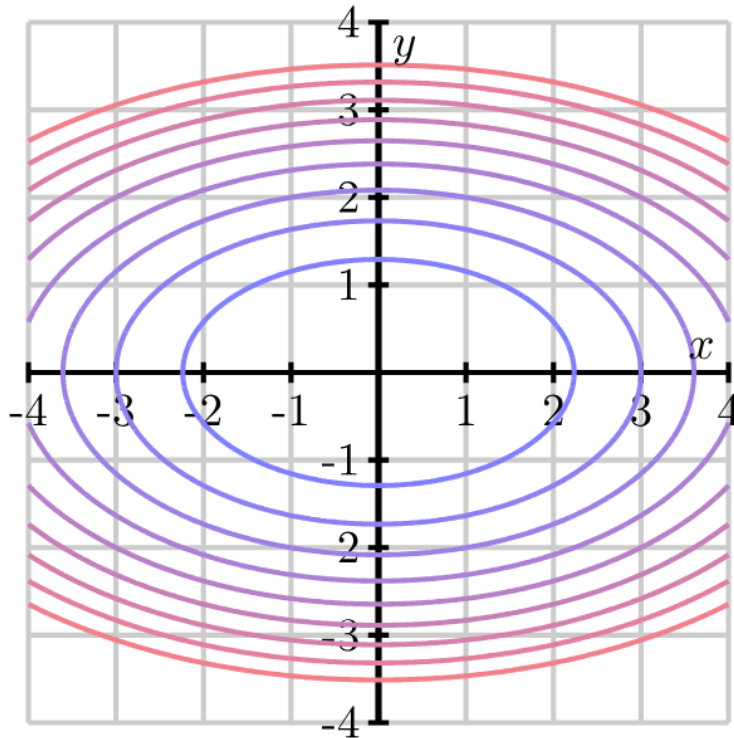**Checkpoint: The gradient**

Consider the function $f(x,y) = x^2 + 3y^2$; here's a contour plot of the function but with the contours deliberately not labeled.

(a) Compute $\nabla f(x,y)$.

(b) At the point $(1,2)$, what is the direction of greatest increase?

(c) Draw a vector on the contour plot showing the direction of greatest increase.

(d) Find the slope of f in this direction.