Math 280 Multivariable Calculus Fall 2012

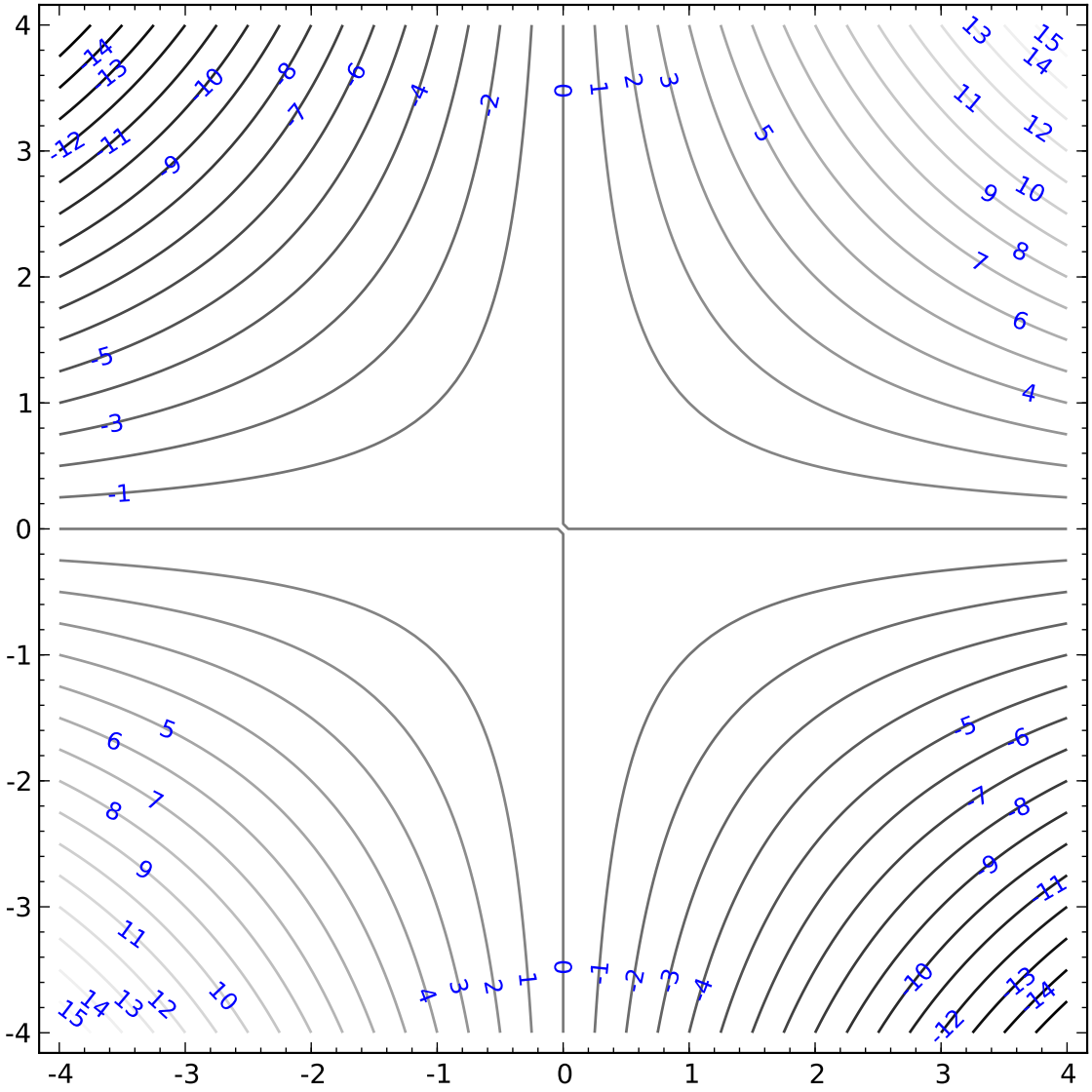
Gradient Vector Fields

1. Consider the function $z = f(x, y) = xy$. Below is a plot showing level sets for z from -15 to 15 in steps of 1 in the window $-4 \leq x \leq 4, -4 \leq y \leq 4$.

   (a) Compute the gradient function $\nabla f(x, y)$

   (b) On the level curve plot, draw estimates of gradient vectors at a variety of points throughout the window.

   (c) For each of the points at which you estimated a gradient vector in part (b), evaluate the gradient vector from part (a). Compare your estimate with the exact value.



2. Consider the function $z = f(x, y) = x^2 + y^2$. Below is a plot showing level sets for z from 0 to 17 in steps of 1 in the window $-3 \leq x \leq 3, -3 \leq y \leq 3$. (Note that the level set for $z = 0$ is the point at the origin.)

   (a) Compute the gradient function $\nabla f(x, y)$

   (b) On the level curve plot, draw estimates of gradient vectors at a variety of points throughout the window.

   (c) For each of the points at which you estimated a gradient vector in part (b), evaluate the gradient vector from part (a). Compare your estimate with the exact value.