Multivariate Calculus

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 $-4 \le x \le 4, -4 \le y \le 4$.
 - (a) On the level curve plot, draw estimates of gradient vectors at a variety of points throughout the window.
 - (b) Compute the gradient $\vec{\nabla} f(x, y)$.
 - (c) For each of the points at which you estimated a gradient vector in (a), evaluate the gradient vector from (b). 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 $-3 \le x \le 3, -3 \le y \le 3$. (Note that the level set for z = 0 is the point at the origin.)
 - (a) On the level curve plot, draw estimates of gradient vectors at a variety of points throughout the window.
 - (b) Compute the gradient $\vec{\nabla} f(x, y)$.
 - (c) For each of the points at which you estimated a gradient vector in (a), evaluate the gradient vector from (b). Compare your estimate with the exact value.

