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.