

1. Let $f(x, y) = \sqrt{x} + xyz$. Estimate $f(1.1, 1.9, 3.1)$.

2. Estimate the value of $e^{-.01}\sqrt{3.9}$. What function should you use? What point?

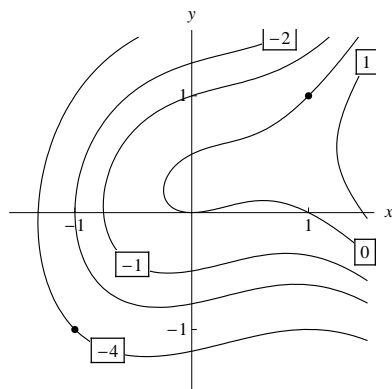
3. In this problem, we derive the equation for the linearization. This will also be useful when we talk about tangent planes. Let $f(x, y)$ be a function and $(a, b, f(a, b))$ be a point on the graph.

(a) Recall that one variable linearizations are tangent lines. Find the linearization of $f(x, b)$ in the plane $y = b$.

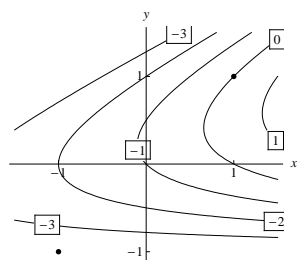
(b) Find the linearization of $f(a, y)$ in the plane $x = a$.

(c) It stands to reason that the two variable linearization contains the one variable ones. Find the equation for the plane containing the two lines you found above. What is this equation? (Hint: replace z with $L(x, y)$)

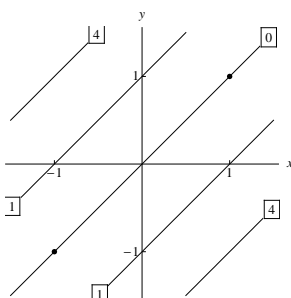
4. Suppose the mysterious function $f(x, y)$ has the following level set diagram (contour map).



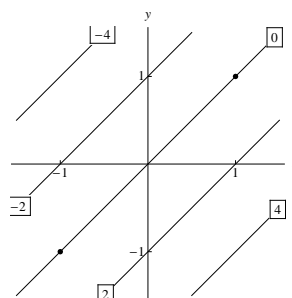
The points $(1, 1)$ and $(-1, -1)$ are marked with dots. Let $L_1(x, y)$ be the linearization of f at $(1, 1)$ and $L_2(x, y)$ be the linearization of f at $(-1, -1)$. Which of the following is the level set diagram of $L_1(x, y)$? Which of the following is the level set diagram of $L_2(x, y)$?



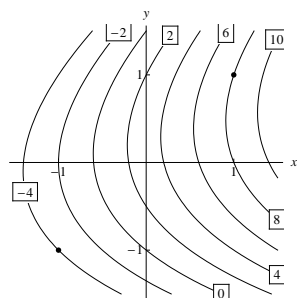
(A)



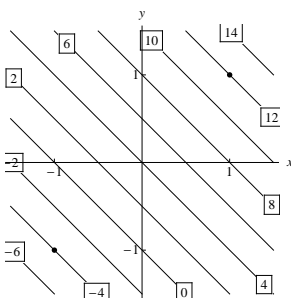
(B)



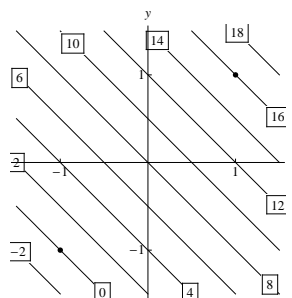
(C)



(D)



(E)



(F)