

**WORKSHEET 11/20/23**  
**MATH 2331, FALL 2023**

(1) Decide whether the following functions have minima or maxima.

(a)  $q(x, y) = x^2 + y^2$

(b)  $q(x, y) = x^2 - y^2$

(2) For each of the functions from #1, sketch the level curve  $q(x, y) = 1$ .

(3) Repeat #1 and #2 for the function  $q(x, y) = 8x^2 - 4xy + 5y^2$ .

(4) Determine whether the following quadratic form is positive definite:

$$q(x, y, z) = 5x^2 - 4xy + 2y^2 + 2xz + 2yz + 2z^2.$$