Classroom Voting Questions:
Multivariable Calculus

15.2 Optimization

1. Estimate the global maximum and minimum of the functions whose level curves are given below. How many times does each occur?

(a) Max \(\approx 6\), occurring once; min \(\approx -6\), occurring once
(b) Max \(\approx 6\), occurring once; min \(\approx -6\), occurring twice
(c) Max \(\approx 6\), occurring twice; min \(\approx -6\), occurring twice
(d) Max \(\approx 6\), occurring three times; min \(\approx -6\), occurring three times
(e) None of the above

2. What are the global maximum and minimum values of \(f(x, y) = x^2 + y^2\) on the triangular region in the first quadrant bounded by \(x + y = 2\), \(x = 0\), \(y = 0\)?

(a) Maximum = 2, Minimum = -2
(b) Maximum = 2, Minimum = 0
3. The function \( f(x, y) = x^3 + 12xy + y^4 \) has:

(a) no global maxes or mins
(b) a global max, but no global min
(c) a global min, but no global max
(d) both a global min and a global max

4. Which of the following would be enough evidence to conclude that a smooth function \( f(x, y) \) has a global min?

(a) \( D \) is always positive
(b) \( f_{xx} > 0 \) and \( f_{yy} > 0 \)
(c) \( f(x, y) \) has no saddle points or local maxes
(d) none of the above