

Classroom Voting Questions: Multivariable Calculus

15.1 Local Extrema

1. Which of these functions has a critical point at the origin?

- (a) $f(x, y) = x^2 + 2y^3$
- (b) $f(x, y) = x^2y + 4xy + 4y$
- (c) $f(x, y) = x^2y^3 - x^4 + 2y$
- (d) $f(x, y) = x \cos y$
- (e) All of the above

2. True or False? The function $f(x, y) = x^2y + 4xy + 4y$ has a local maximum at the origin.

- (a) True, and I am very confident
- (b) True, but I am not very confident
- (c) False, but I am not very confident
- (d) False, and I am very confident

3. Which of these functions does not have a critical point?

- (a) $f(x, y) = x^2 + 2y^3$
- (b) $f(x, y) = x^2y + 4xy + 4y$
- (c) $f(x, y) = x^2y^3 - x^4 + 2y$
- (d) $f(x, y) = x \cos y$
- (e) All have critical points

4. Which of these functions has a critical point at the origin?

- (a) $f(x, y) = x^2 + 2x + 2y^3 - y^2$
- (b) $f(x, y) = x^2y + xy$
- (c) $f(x, y) = x^2y^2 - (1/2)x^4 + 2y$
- (d) $f(x, y) = x^4y - 7y$

5. How would you classify the function $f(x, y) = x^2y + xy$ at the origin?

- (a) This is a local maximum.
- (b) This is a local minimum.
- (c) This is a saddle point.
- (d) We cannot tell.
- (e) This is not a critical point.

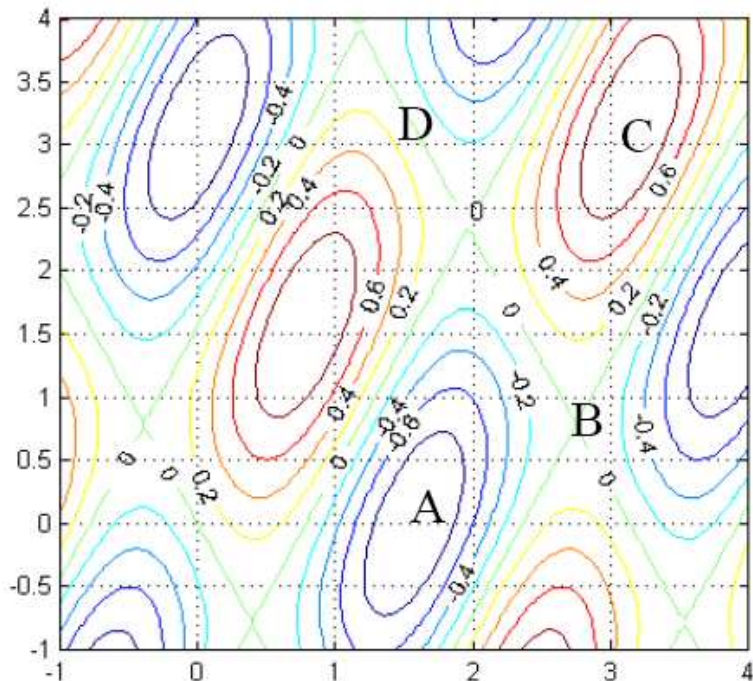
6. Which of these functions does not have a critical point with $y = 0$?

- (a) $f(x, y) = x^2 + 2x + 2y^3 - y^2$
- (b) $f(x, y) = x^2y + xy$
- (c) $f(x, y) = x^2y^2 - (1/2)x^4 + 2y$
- (d) $f(x, y) = x^4y - 7y$

7. Which of these functions does not have a critical point with $x = -1$?

- (a) $f(x, y) = x^2 + 2x + 2y^3 - y^2$
- (b) $f(x, y) = x^2y + xy$
- (c) $f(x, y) = x^2y^2 - (1/2)x^4 + 2y$
- (d) $f(x, y) = x^4y - 7y$

8. Which of the following points are critical points?



- (a) A and C
- (b) A, C, and D
- (c) A, B, and C
- (d) A, B, C, and D

9. Which of the following guarantees a saddle point of the function $f(x, y)$ at (a, b) ?

- (a) f_{xx} and f_{yy} have the same sign at (a, b) .
- (b) f_{xx} and f_{yy} have opposite signs at (a, b) .
- (c) f_{xy} is negative at (a, b) .
- (d) none of the above