Gandaki University

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Bachelor of Information Technology

BSM 102

Exercise on Maxima and Minima of Function of Several Variables

In problem [1-18] find the critical points of the given functions and classify each as a relative maximum, a relative minimum, or a saddle point.

1. $f(x, y) = 5 - x^2 - y^2$
2. . $f(x, y) = 2x^2 - 3y^2$
3. . $f(x, y) = xy$
4. $f(x, y) = x^2 + 2y^2 - xy + 14y$
5. $f(x, y) = \frac{16}{x} + \frac{6}{y} + x^2 - 3y^2$
6. $f(x, y) = xy + \frac{8}{x} + \frac{8}{y}$
7. $f(x, y) = 2x^3 + y^3 + 3x^2 - 3y - 12x - 4$
8. $f(x, y) = (x - 1)^2 + y^3 - 3y^2 - 9y + 5$
9. $f(x, y) = x^3 + y^2 - 6xy + 9x + 5y + 2$
10. $f(x, y) = -x^4 - 32x + y^3 - 12y + 7$
11. $f(x, y) = xy^2 - 6x^2 - 3y^2$
12. $f(x, y) = x^2 - 6xy - 2y^3$
13. $f(x, y) = \left(x^2 + 2y^2\right) e^{1-x^2-y^2}$
14. $f(x, y) = e^{-\left(x^2+y^2-6y\right)}$
15. $f(x, y) = x^3 - 4xy + y^3$
16. $f(x, y) = (x - 4)\ln(xy)$
17. . $f(x, y) = 4xy - 2x^4 - y^2 + 4x - 2y$
18. $f(x, y) = 2x^4 + x^2 + 2xy + 3x + y^2 + 2y + 5$
19. A company produces x units of commodity A and y units of commodity B. All the units can be sold for $p = 100 - x$ dollars per unit of A and $q = 100 - y$ dollars per unit of B. The cost (in dollars) of producing these units is given by the joint-cost function $C(x, y) = x^2 + xy + y^2$. What should x and y be to maximize profit?
20. Repeat Exercise 19 for the case where $p = 20 - 5x, q = 4 - 2y$, and $C = 2xy + 4$.