p. 991 (12.7)

Locate all critical points and classify them using Theorem 7.2.

5. $f(x,y) = e^{-x^2}(y^2+1)$

7. $f(x,y) = x^3 - 3xy + y^3$

Local all critical points and analyze each graphically.

13. $f(x,y) = x^2 - \dfrac{4xy}{y^2+1}$

15. $f(x,y) = xe^{-x^2-y^2}$

Find the absolute extrema of the function on the region.

37. $f(x,y) = x^2 + 3y - 3xy,$ region bounded by $y = x,\ y = 0$ and $x = 2$

39. $f(x,y) = x^2 + y^2,$ region bounded by $(x-1)^2 + y^2 = 4$

Label the statement as true of false and explain why.

51. If $f(x,y)$ has a local minimum at $(a,b),$ then $\dfrac{\partial f}{\partial x}(a,b) = \dfrac{\partial f}{\partial y}(a,b) = 0.$

52. If $\dfrac{\partial f}{\partial x}(a,b) = \dfrac{\partial f}{\partial y}(a,b) = 0,$ then $f(x,y)$ has a local maximum at $(a,b).$

55. (Instruction and image in book)
56. (Instruction and image in book)
57. (Instruction and image in book)
58. (Instruction and image in book)

61. Construct the function $d(x,y)$ giving the distance from a point (x,y,z) on the paraboloid $z = 4 - x^2 - y^2$ to the point $(3,-2,1).$ Then determine the point that minimizes $d(x,y).$

62. Use the method of exercise 61 to find the closest point on the cone $z = \sqrt{x^2+y^2}$ to the point $(2,-3,0).$

63. Use the method of exercise 61 to find the closest point on the sphere $x^2 + y^2 + z^2 = 9$ to the point $(2,1,-3).$

65. Show that the function $f(x,y) = 5xe^y - x^5 - e^{5y}$ has exactly one critical point, which is a local maximum but not an absolute maximum.